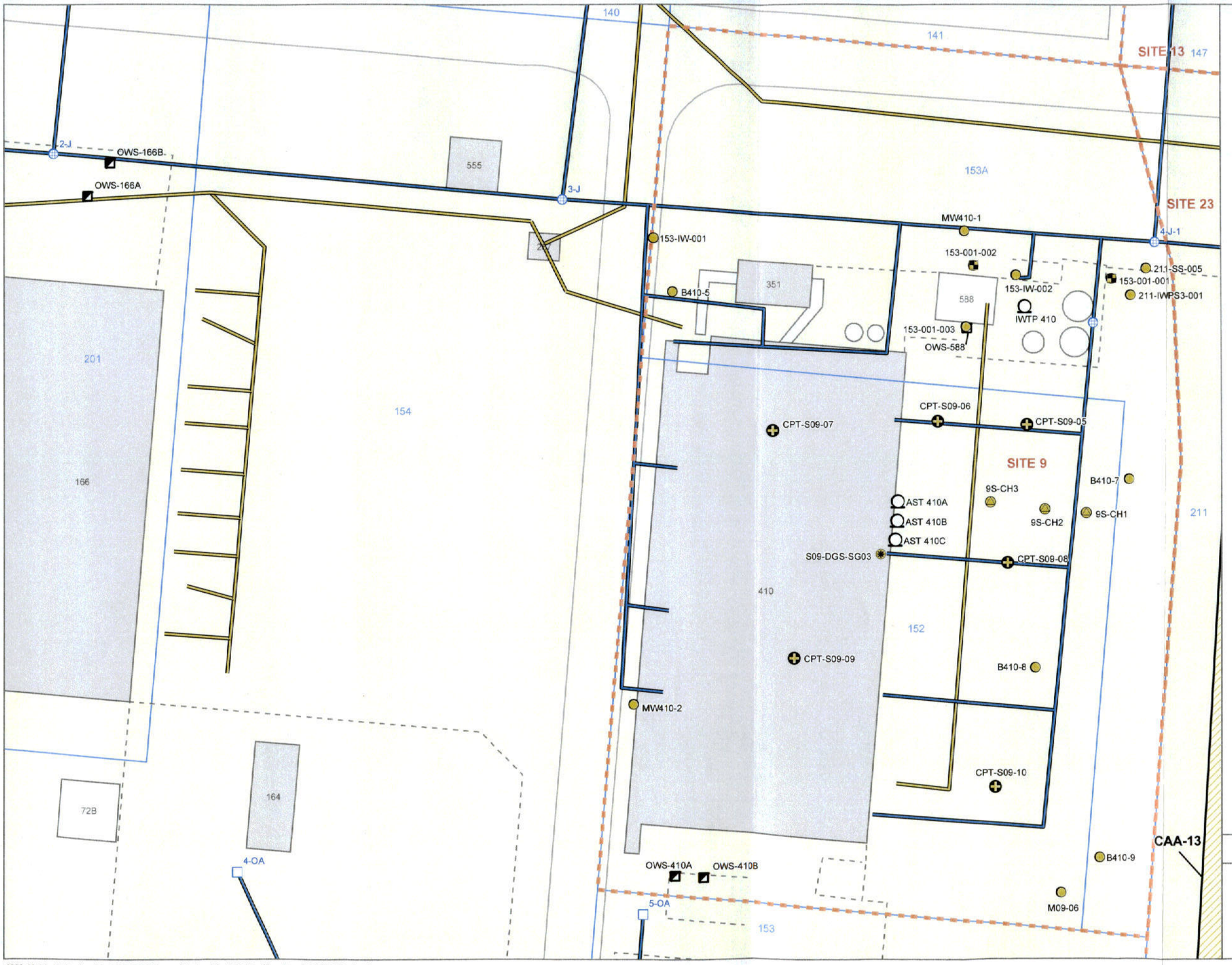
FIGURES



SOIL SAMPLE LOCATION

- Direct-Push
- Soil Boring
- Soil Gas
- Soil Punch

ABOVEGROUND STORAGE TANK (AST)

- Present
- Removed

- OIL WATER SEPARATOR
- CATCH BASIN
- MANHOLE
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Former

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
EBS = Environmental Baseline Survey
TPH= Total petroleum hydrocarbon

N

25 0 25 50 Feet

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FIGURE F-3-1
SITE 9
SOIL SAMPLE LOCATIONS

Operable Unit 2A
TPH Risk Evaluation
Remedial Investigation Report

2003-11-14 U:\almda_sa\dc026\OU2A\RI\appendix_f\mxd\fig_f-03-01_s09_soil.mxd TtEMI-SA K. Johnson

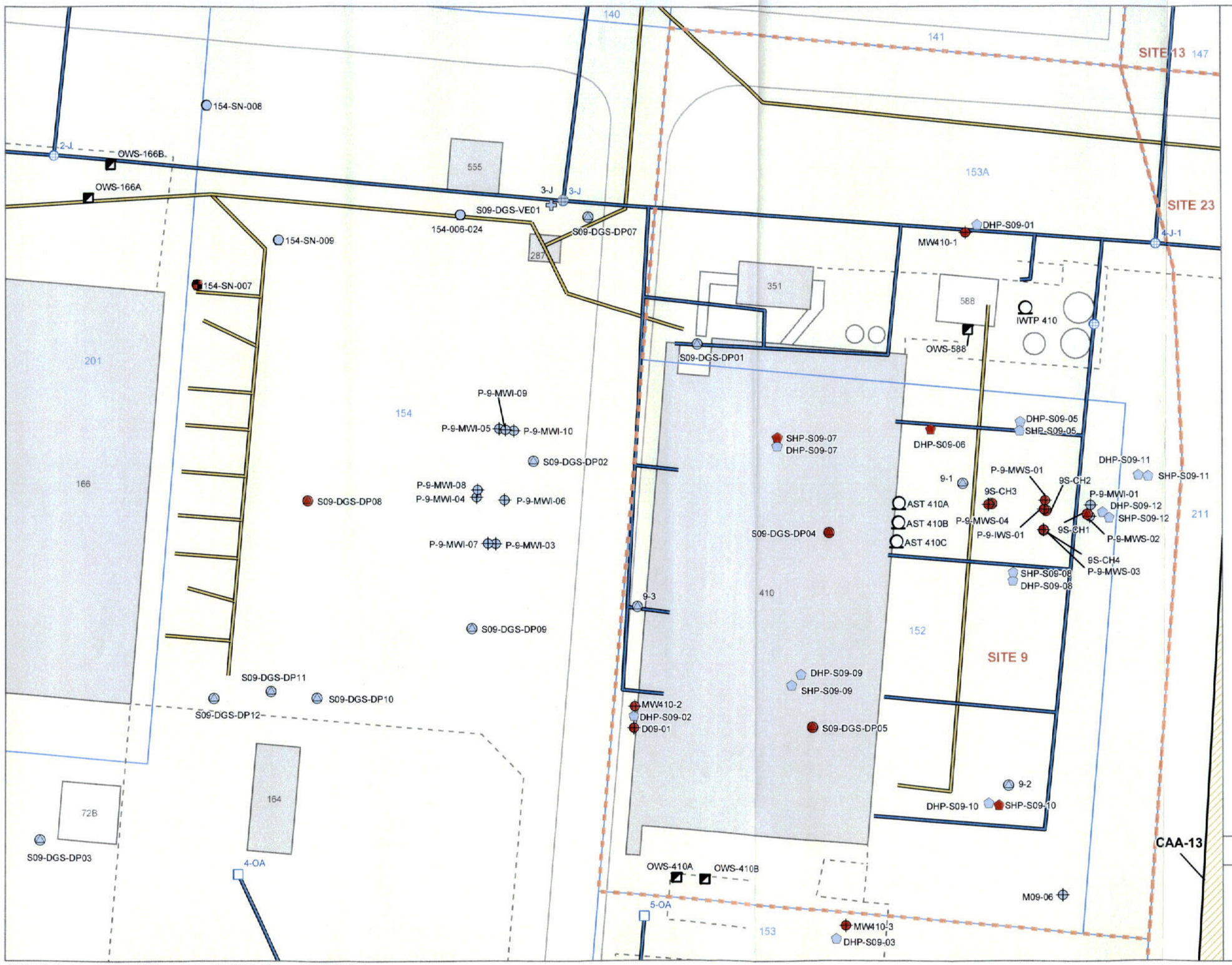

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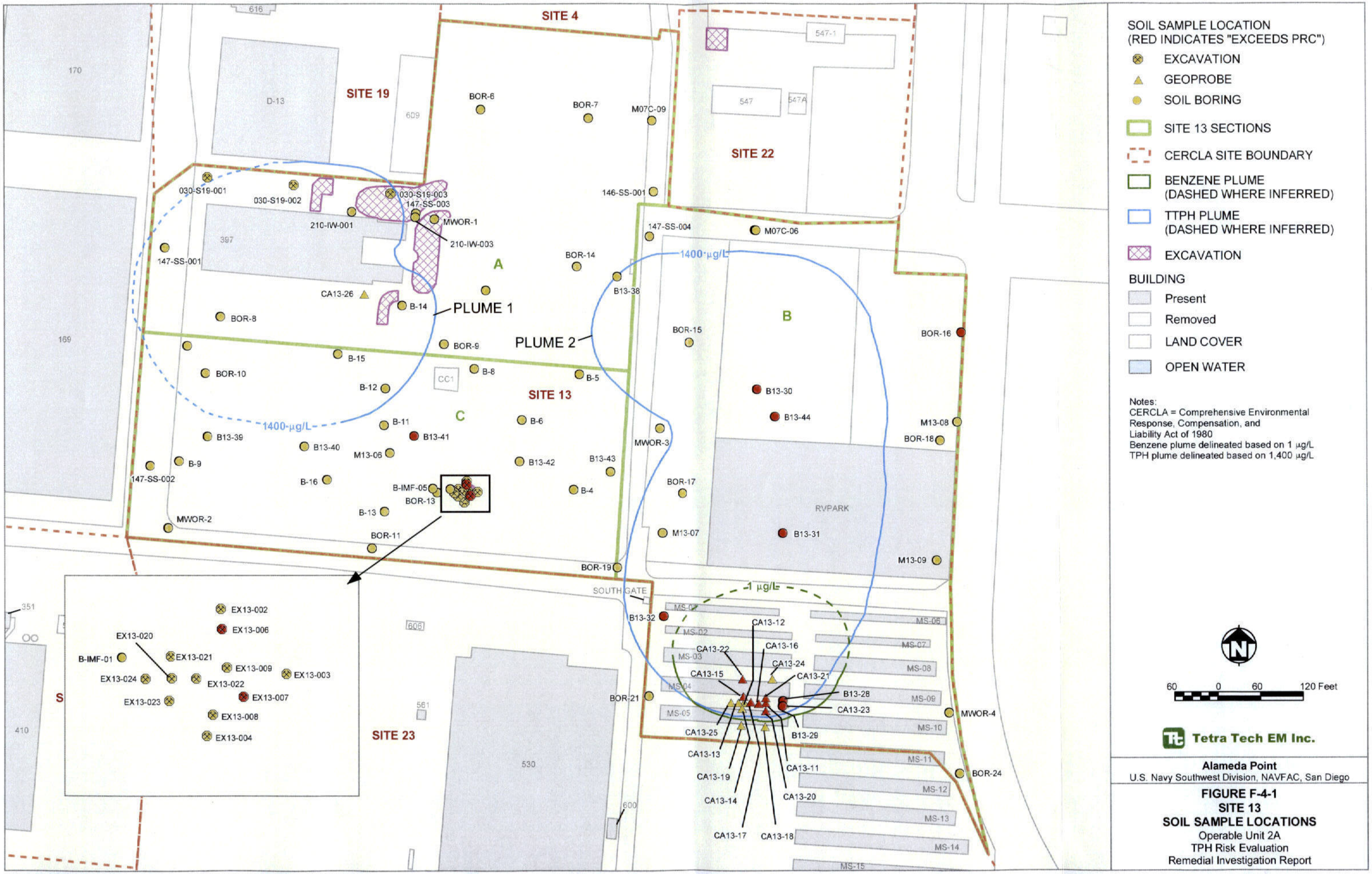
FIGURE F-3-2
SITE 9
GROUNDWATER SAMPLE LOCATIONS

Operable Unit 2A
TPH Risk Evaluation
Internal Draft Remedial Investigation Report

2003-11-19 U:\a\mda_sa\do02B\OU2A\RI\appendix_f\mxd\fig_f-03-02_s09_gw.mxd TtEMI-SA K. Johnson



SOIL SAMPLE LOCATION
(RED INDICATES "EXCEEDS PRC")
EXCAVATION
GEOPROBE
SOIL BORING
SITE 13 SECTIONS
CERCLA SITE BOUNDARY
BENZENE PLUME
(DASHED WHERE INFERRED)
TTPH PLUME
(DASHED WHERE INFERRED)
EXCAVATION
BUILDING
Present
Removed
LAND COVER
OPEN WATER
Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
Benzene plume delineated based on 1 μg/L
TPH plume delineated based on 1,400 μg/L
60 0 60 120 Feet
SITE 4
SITE 19
SITE 22
SITE 13
SITE 23
PLUME 1
PLUME 2
A
B
C
1400 μg/L
1 μg/L
SOUTH GATE
RVPARK
BOR-6
BOR-7
M07C-09
146-SS-001
147-SS-004
M07C-06
030-S19-001
030-S19-002
030-S19-003
147-SS-003
MWOR-1
210-IW-001
210-IW-003
147-SS-001
CA13-26
B-14
BOR-8
BOR-14
B13-38
BOR-15
BOR-16
BOR-9
B-15
BOR-10
B-12
B-8
B-5
B13-30
B13-44
M13-08
BOR-18
B13-39
B13-40
B-11
B13-41
B-6
MWOR-3
B-9
M13-06
B13-42
B13-43
147-SS-002
B-16
B-IMF-05
BOR-13
B-4
BOR-17
B-13
MWOR-2
BOR-11
M13-07
B13-31
M13-09
BOR-19
B13-32
EX13-002
EX13-006
EX13-020
B-IMF-01
EX13-021
EX13-024
EX13-009
EX13-003
EX13-022
EX13-023
EX13-007
EX13-008
EX13-004
CA13-12
CA13-22
CA13-16
CA13-24
CA13-15
CA13-21
B13-28
CA13-23
BOR-21
CA13-25
B13-29
CA13-13
CA13-11
CA13-19
CA13-20
CA13-14
CA13-17
CA13-18
MWOR-4
BOR-24
MS-01
MS-02
MS-03
MS-04
MS-05
MS-06
MS-07
MS-08
MS-09
MS-10
MS-11
MS-12
MS-13
MS-14
MS-15
616
170
D-13
609
547-1
547
547A
397
169
CC1
351
606
561
410
530
600

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FIGURE F-4-1
SITE 13
SOIL SAMPLE LOCATIONS
Operable Unit 2A
TPH Risk Evaluation
Remedial Investigation Report

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SITE 4
SITE 19
SITE 22
SITE 13
SITE 9
SITE 23
PLUME 1
PLUME 2
A
B
C
1400 µg/L
1000 µg/L
100 µg/L
1 µg/L
SOUTH GATE
RV PARK
13GB100
13GB005
M07C-09
M07C-06
6J-1A
6J-1
5J-3
5J-2
4-J-1C
4J-1B
4-J-1A
4-J-1
5-J
5-JA
5-JF
5-JG
6-J
6-JA
6J-F
6-JG
6-JB
6-JC
6-JD
6-JE
S13-DGS-VE01
S13-DGS-VE02
S13-DGS-VE03
MWOR-1
MWOR-2
MWOR-3
MWOR-4
MW-1
MW530-1
CA13-01
CA13-02
CA13-03
CA13-04
CA13-05
CA13-06
CA13-26
B13-30
M13-06
M13-07
M13-08
M13-09
B-IMF-09
B-IMF-10
M-IMF-01
M-IMF-02
DHP-S13-02
DHP-S13-03
DHP-S13-04
D13-01
CA13-11
CA13-12
CA13-13
CA13-14
CA13-15
CA13-16
CA13-17
CA13-18
CA13-19
CA13-20
CA13-21
CA13-22
CA13-23
CA13-24
CA13-25
B13-28
B13-29
GROUNDWATER SAMPLE LOCATION
(RED INDICATES "EXCEEDS PRC")
Geoprobe
Hydropunch
Monitoring Well
Piezometer
Vacuum Extraction
NO SAMPLE COLLECTED
(FREE PRODUCT OBSERVED)
CATCH BASIN
MANHOLE
SANITARY SEWER LINE
STORM SEWER LINE
CERCLA SITE BOUNDARY
BENZENE PLUME
(DASHED WHERE INFERRED)
TTPH PLUME
(DASHED WHERE INFERRED)
SITE 13 SECTIONS
EXCAVATION
LAND COVER
BUILDING
Former
Present
Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
PRC = Preliminary remediation criteria for TPH
TTPH = Total total petroleum hydrocarbon
Benzene plume delineated based on 1 µg/L
TPH plume delineated based on 1,400 µg/L
60 0 60 120 Feet
Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE F-4-2
SITE 13
GROUNDWATER SAMPLE LOCATIONS

Operable Unit 2A
TPH Risk Evaluation
Remedial Investigation Report

2003-11-18 U:\almda_sa\do028\ou2a\ri\appendix_f\mxd\fig_f-04-02_s13_gw.mxd TtEMI-SA K. Johnson

AST 372
372
164A
SWMU 372
134A
OWS-372B
CAA-4B
SITE 4
NADEP GAP 52
360
372-1-MOJ
372-2-MOJ
372-MW2
616-1
616-2
143
MWD13-1
B19-17
4J-1
030-S19-007
BD13-5
BD13-6
BD13-7
5J-3B
5J-3A
610
B19-19
MWD13-2
SWMU 616
616
170
SITE 19
164
Text
BD13-8
BD13-9
BD13-10
142
B19-18
BD13-11
BD13-12
BD13-13
M19-05
030-S19-005
D-13
609
146
MWD13-3
BD13-14
BD13-15
BD13-16
134-006-041
134-Z22-025
SITE 13
210-IW-004
134
134-SN-003
147
OWS-397D
OWS-397C
CAA-13
141
5J-3
169
397
4-J-1C

SOIL SAMPLE LOCATION
(RED = GREATER THAN SCREENING CRITERIA)
- Excavation
- Geoprobe
- Monitoring Well
- Soil Boring

ABOVEGROUND STORAGE TANK (AST)
- Present
- Removed

UNDERGROUND STORAGE TANK (UST)
- Present
- Removed
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL WATER SEPARATOR
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
TPH = Total petroleum hydrocarbon

N

25 0 25 50 Feet

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FIGURE F-5-1
SITE 19
SOIL SAMPLE LOCATIONS

Operable Unit 2A
TPH Risk Evaluation
Remedial Investigation Report

2003-11-18 U:\almda_sa\do028\OU2A\RI\appendix_f\mxd\fig_f-05-01_s19_soil.mxd TtEMI-SA K. Johnson

AST 372
372
164A
SWMU 372
134A
OWS-372B
CAA-4B
SITE 4
NADEP GAP 52
360
372-1-MOJ
372-2-MOJ
372-MW2
616-1
616-2
MWD13-1
DHP-S19-01
143
5J-3B
5J-3A
610
DHP-S19-02
D19-01
MWD13-2
SWMU 616
616
170
SITE 19
164
DHP-S19-05
Text
SHP-S19-01
142
SHP-S19-02
M19-05
SHP-S19-03
DHP-S19-03
D-13
MWD13-3
609
146
134-006-041
MWD13-4
SITE 13
DHP-S19-04
134
147
OWS-397D
OWS-397C
CAA-13
141
169
397
4-J-1C

GROUNDWATER SAMPLE LOCATION
(RED = GREATER THAN SCREENING CRITERIA)
- Hydropunch
- Geoprobe
- Monitoring Well

ABOVEGROUND STORAGE TANK (AST)
- Present
- Removed

UNDERGROUND STORAGE TANK (UST)
- Present
- Removed
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- GENERATOR ACCUMULATION POINT (GAP)
- CATCH BASIN
- MANHOLE
- OIL WATER SEPARATOR
- FENCE
- FUEL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
TPH = Total petroleum hydrocarbon

N

25 0 25 50 Feet

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE F-5-2
SITE 19
GROUNDWATER SAMPLE LOCATIONS

Operable Unit 2A
TPH Risk Evaluation
Remedial Investigation Report

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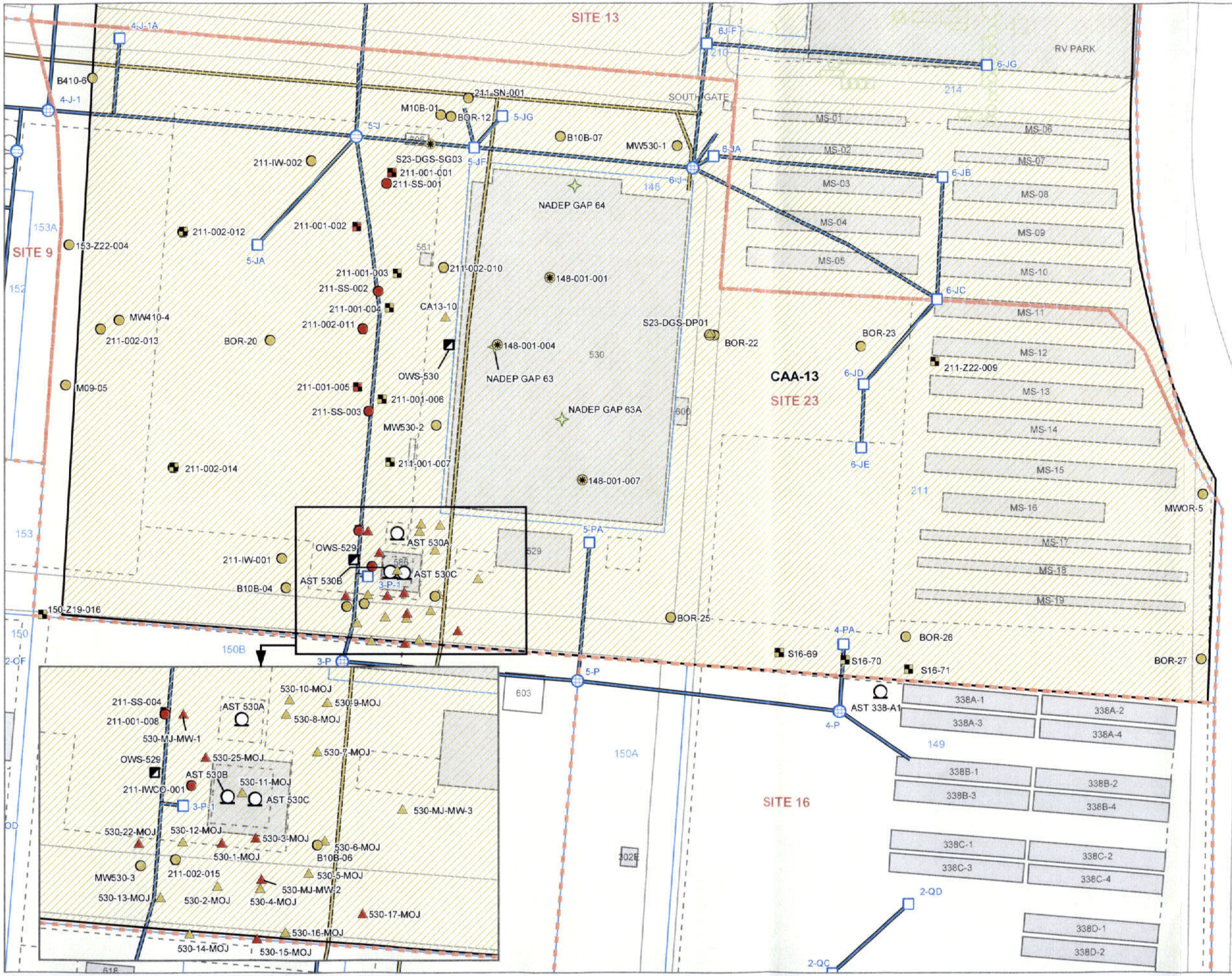

SOIL SAMPLE LOCATION
(RED = GREATER THAN SCREENING CRITERIA)

- Direct-Push
- Geoprobe
- Soil Boring
- Soil Gas
- Surface Location

ABOVEGROUND STORAGE TANK (AST)

- Present
- Removed

- CATCH BASIN
- MANHOLE
- OIL WATER SEPARATOR
- GENERATOR ACCUMULATION POINT (GAP)
- FENCE
- SANITARY SEWER LINE
- STORM SEWER LINE
- CORRECTIVE ACTION AREA (CAA)
- FORMER OIL REFINERY
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING

- Present
- Removed

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
TPH = Total petroleum hydrocarbon

50 0 50 100 Feet

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Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE F-6-1
SITE 23
SOIL SAMPLE LOCATIONS

Operable Unit 2A
TPH Risk Evaluation
Remedial Investigation Report

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SITE 13
SITE 9
SITE 16
SITE 23
CAA-13
RV PARK
SOUTH GATE
4-J-1A
4-J-1
5-J
5-JG
5-JF
6-JG
6-JA
6-JB
6-JC
6-JD
6-JE
6-J
5-JA
4-PA
5-P
4-P
3-P
3-P-1
5-PA
2-QD
2-QC
DHP-S10B-01
D10B-02
M10B-01
DHP-S10B-02
MW530-1
S23-DGS-VE02
S23-DGS-VE01
NADEP GAP 64
NADEP GAP 63
NADEP GAP 63A
211-002-012
211-002-010
211-002-013
211-002-011
211-002-014
211-002-015
MW410-4
DHP-S09-04
M09-05
CA13-08
CA13-07
CA13-10
DHP-S10B-05
SHP-S10B-05
OWS-530
MW530-2
SHP-S10B-06
1400 µg/L
530-20-MOJ
OWS-529
AST 530A
AST 530B
AST 530C
DHP-S10B-04
CA13-09
530-10-MOJ
530-9-MOJ
530-8-MOJ
530-MJ-MW-1
530-25-MOJ
530-7-MOJ
530-11-MOJ
530-3-MOJ
530-MJ-MW-3
530-12-MOJ
530-18-MOJ
530-22-MOJ
530-1-MOJ
530-6-MOJ
DHP-S10B-03
MW530-3
D10B-01
530-5-MOJ
530-MJ-MW-2
530-13-MOJ
530-2-MOJ
530-4-MOJ
530-17-MOJ
530-14-MOJ
530-16-MOJ
530-15-MOJ
AST 338-A1
DHP-S13-05
MWOR-5
MS-01
MS-02
MS-03
MS-04
MS-05
MS-06
MS-07
MS-08
MS-09
MS-10
MS-11
MS-12
MS-13
MS-14
MS-15
MS-16
MS-17
MS-18
MS-19
338A-1
338A-2
338A-3
338A-4
338B-1
338B-2
338B-3
338B-4
338C-1
338C-2
338C-3
338C-4
338D-1
338D-2
153A
152
153
150
150B
150A
149
148
214
211
603
602E
618
GROUNDWATER SAMPLE LOCATION
(RED = GREATER THAN SCREENING CRITERIA)
Geoprobe
Hydropunch
Manhole / Storm Drain
Monitoring Well
Vacuum Extraction
ABOVEGROUND STORAGE TANK (AST)
Present
Removed
CATCH BASIN
MANHOLE
OIL WATER SEPARATOR
GENERATOR ACCUMULATION POINT (GAP)
FENCE
SANITARY SEWER LINE
STORM SEWER LINE
CORRECTIVE ACTION AREA (CAA)
FORMER OIL REFINERY
TTPH PLUME
CERCLA SITE BOUNDARY
ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
LAND COVER
BUILDING
Present
Removed
Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NADEP = Naval Aviation Depot Alameda
TPH = Total petroleum hydrocarbon
TPH plume delineated based on 1,400 µg/L
N
50 0 50 100 Feet
Tetra Tech EM Inc.
Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego
FIGURE F-6-2
SITE 23
GROUNDWATER SAMPLE LOCATIONS
Operable Unit 2A
TPH Risk Evaluation
Remedial Investigation Report
2003-11-18 U:\almda_sa\dc028\OU2A\RI\appendix_f\mxd\fig_f-06-02_s23_gw.mxd TtEMI-SA K. Johnson

TABLES

TABLE F-2-1: PRELIMINARY REMEDIATION CRITERIA

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

	Preliminary Remediation Criteria for Soil Contamination, in mg/kg		Preliminary Remediation Criteria for Groundwater Contamination, in mg/L				
			Health Risk from Inhalation			Marine Ecological Receptors	
	Residential	Nonresidential	Residential	Nonresidential	Potential Drinking Water Source (MCL)	Storm Drain Exposure Pathway (AWQC)	Groundwater Discharge to Surface Water (<= 250 feet)
Total Petroleum Hydrocarbon-Associated							
Benzene	0.65	1.5	0.00991	0.0167	0.001	0.7	12.323
Toluene	520	520	33.2	46.5	0.15	5	-
Ethylbenzene	230	230	169	169	0.7	0.43	-
Xylenes (Total)	210	210	106	148	1.75	-	-
MTBE	17	37	8.1	13.6	0.005	8	140.833
Lead	221	4,766	-	-	0.015	0.0081	0.143
Total Petroleum Hydrocarbon Fractions							
Gasoline	1,030	5,900	-	-	-	-	-
Diesel/Jet Fuel	1,380	6,700	-	-	-	-	-
Motor Oil	1,900	9,400	-	-	-	-	-
Total Total Petroleum Hydrocarbons							
TTPH	-	-	-	-	-	1.4	20

Indicators of Potential Free Product	
TTPH in water	20 mg/L
TTPH in soil	14,000 mg/kg

Notes:

MCL	Maximum contaminate levels
AWQC	Ambient water quality criteria
-	No preliminary remediation criteria established
mg/kg	milligrams per kilogram
mg/L	miligrams per liter
TPH	Total petroleum hydrocarbons
TTPH	Total TPH (sum of all TPH fractions)

TABLE F-3-1: SOIL ANALYTICAL DATA - SITE 9

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Depth (feet)	Concentration (mg/kg)										
				TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
153-001-001	153-0001	Apr-95	3 - 3.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	NA
153-001-001	153-0001M	Apr-95	0.5 - 1	310	11 U	0.52 U	310	NA	NA	NA	NA	NA	NA	NA
153-001-002	153-0002	Apr-95	3 - 3.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	NA
153-001-002	153-0002M	Apr-95	0.5 - 1	730	11 U	0.55 U	730	NA	NA	NA	NA	NA	NA	NA
153-001-003	153-0003	Apr-95	1 - 1.5	23	10 U	0.5 U	23 YJ	NA	NA	NA	NA	NA	NA	NA
153-001-003	153-0003M	Apr-95	1 - 1.5	ND	1.1 U	0.53 U	26 U	NA	NA	NA	NA	NA	NA	NA
153-IW-001	153I-001	Jan-95	8 - 8.5	ND	12 U	0.6 U	24 U	NA	0.01 U	0.01 U	0.012 U	0.012 U	NA	15.8
153-IW-001	153I-001M	Jan-95	8 - 8.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.01 U	0.03	NA	25 U
153-IW-002	153I-002	Jan-95	7 - 7.5	202.4	12 U	2.4 ZJ	200 YJ	NA	0.01 U	0.01 U	0.012 U	0.012 U	NA	2.9
153-IW-002	153I-002M	Jan-95	7 - 7.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.01 U	0.03	NA	25 U
211-IWPS3-001	211P-001	Jan-95	8.5 - 9	78	12 U	0.61 U	78 YJ	NA	0.01 U	0.01 U	0.012 U	0.012 U	NA	3.8
211-IWPS3-001	211P-001M	Jan-95	8.5 - 9	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.01 U	0.03	NA	25 U
211-SS-005	211M-005M	May-95	10 - 11	168	38	0.6 U	130	NA	0.01 U	0.01 U	0.006 U	0.006 U	NA	3.7
9S-CH1	9S-CH1	Jun-02	5 - 15	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.0051 U	0.01	0.005 U	4.2
9S-CH2	9S-CH2	Jun-02	5 - 15	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.0053 U	0.011	0.005 U	3.3
9S-CH3	9S-CH3	Jun-02	5 - 15	NA	NA	NA	NA	NA	0.01 U	0.01	0.12	0.367	0.007 U	44.6
B410-5	B410-5 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 U
B410-5	B410-5 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.01 U	0.02	0.005 U	0.005 U	NA	NA
B410-5	B410-5 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 U
B410-5	B410-5 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	0.01 U	0.04	0.005 U	0.005 U	NA	NA
B410-5	B410-5 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U
B410-5	B410-5 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.006 U	0.006 U	NA	NA
B410-5	B410-5 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.1 U
B410-5	B410-5 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	0.01 U	0.03	0.006 U	0.006 U	NA	NA
B410-5	B410-5 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13.4
B410-5	B410-5 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16.2
B410-5	B410-5 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.01 U	0.05	0.006 U	0.006 U	NA	NA
B410-5	B410-5 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.2
B410-7	B410-7 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
B410-7	B410-7 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.03 U	0.73 D	0.027 U	0.027 U	NA	NA
B410-7	B410-7 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.4 U
B410-7	B410-7 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	0.01 U	0.11	0.006 U	0.006 U	NA	NA
B410-7	B410-7 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U
B410-7	B410-7 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.01 U	0.06	0.007 U	0.007 U	NA	NA
B410-7	B410-7 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10.9
B410-7	B410-7 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.01 U	0.03	0.007 U	0.007 U	NA	NA
B410-7	B410-7 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.8 U
B410-7	B410-7 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	0.01 U	0.01	0.007 U	0.007 U	NA	NA
B410-7	B410-7 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
B410-8	B410-8 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
B410-8	B410-8 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.01 U	0.01	0.006 U	0.006 U	NA	NA
B410-8	B410-8 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
B410-8	B410-8 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	0.01 U	0.02	0.005 U	0.005 U	NA	NA

TABLE F-3-1: SOIL ANALYTICAL DATA - SITE 9

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Depth (feet)	Concentration (mg/kg)										
				TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
B410-8	B410-8 [4.5-5.0]	Jul-90	4.5 - 5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
B410-8	B410-8 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	0.01 U	0.03	0.005 U	0.005 U	NA	NA
B410-8	B410-8 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
B410-8	B410-8 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.01 U	0.02	0.002 J	0.029	NA	NA
B410-8	B410-8 [7.5-8.0]	Jul-90	7.5 - 8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
B410-8	B410-8 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	NA	0 J	NA	NA	NA	NA
B410-8	B410-8 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
B410-9	B410-9 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.1
B410-9	B410-9 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.01 U	0 J	0.005 U	0.005 U	NA	NA
B410-9	B410-9 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.1 U
B410-9	B410-9 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	0.01 U	0.04	0.006 U	0.006 U	NA	NA
B410-9	B410-9 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
B410-9	B410-9 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.01 U	0.01	0.006 U	0.006 U	NA	NA
B410-9	B410-9 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.3 U
B410-9	B410-9 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.01 U	0.01	0.007 U	0.007 U	NA	NA
B410-9	B410-9 [12.0-12.5]	Jul-90	12 - 12.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.5 U
B410-9	B410-9 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	0.01 U	0.02	0.007 U	0.007 U	NA	NA
B410-9	B410-9 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12.9
CPT-S09-05	280-S09-004	Sep-94	0 - 0.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.002 J	NA	3.4
CPT-S09-05	280-S09-005	Sep-94	2.5 - 3	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	2.4
CPT-S09-05	280-S09-006	Sep-94	4.7 - 5.2	NA	NA	NA	NA	NA	0.01 U	0 J	0.16	0.086	NA	10.4
CPT-S09-06	280-S09-007	Sep-94	0 - 0.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	2.4
CPT-S09-06	280-S09-008	Sep-94	2.5 - 3	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	2.1
CPT-S09-06	280-S09-009	Sep-94	4.7 - 5.2	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	2.6
CPT-S09-07	280-S09-010	Sep-94	0 - 0.5	NA	NA	NA	NA	NA	0.12 U	0.12 U	0.12 U	0.12 U	NA	5.8
CPT-S09-07	280-S09-011	Sep-94	2.5 - 3	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.054 U	0.24	NA	4.3
CPT-S09-07	280-S09-012	Sep-94	5 - 5.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	2.6
CPT-S09-08	280-S09-013	Sep-94	0 - 0.5	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.053 U	0.053 U	NA	4.5
CPT-S09-08	280-S09-014	Sep-94	2.5 - 3	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.052 U	0.12	NA	3
CPT-S09-08	280-S09-015	Sep-94	5 - 5.5	NA	NA	NA	NA	NA	0.06 U	0.06 U	0.057 U	2.9	NA	22.2 J
CPT-S09-09	280-S09-016	Sep-94	0	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	3
CPT-S09-09	280-S09-017	Sep-94	2.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	2.3
CPT-S09-09	280-S09-018	Sep-94	5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	2.5
CPT-S09-10	280-S09-019	Sep-94	0 - 0.5	NA	NA	NA	NA	NA	0.05 U	0.05 J	0.2	3.1	NA	6.8 J
CPT-S09-10	280-S09-020	Sep-94	2.5 - 3	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.052 U	0.039 J	NA	2.1 UJ
CPT-S09-10	280-S09-021	Sep-94	5 - 5.5	NA	NA	NA	NA	NA	0.06 U	0.06 U	0.055 U	0.33	NA	2.4 UJ
M09-06	280-S09-167	Nov-94	1 - 2	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	1.3
M09-06	280-S09-168	Nov-94	2.5 - 3.5	NA	NA	NA	NA	NA	0.01 U	0 J	0.011 U	0.011 U	NA	1.6
M09-06	280-S09-169	Nov-94	5.5 - 6.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.011 U	NA	2.8
MW410-1	MW410-1 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 U
MW410-1	MW410-1 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.01 U	0.05	0.005 U	0.005 U	NA	NA
MW410-1	MW410-1 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 U
MW410-1	MW410-1 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	0.01 U	0.06	0.006 U	0.006 U	NA	NA

TABLE F-3-1: SOIL ANALYTICAL DATA - SITE 9

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Depth (feet)	Concentration (mg/kg) TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
MW410-1	MW410-1 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.1 U
MW410-1	MW410-1 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.01 U	0.04	0.007 U	0.007 U	NA	NA
MW410-1	MW410-1 [7.5-8.0]	Jul-90	7.5 - 8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 U
MW410-1	MW410-1 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 U
MW410-1	MW410-1 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.01 U	0.03	0.006 U	0.006 U	NA	NA
MW410-1	MW410-1 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10
MW410-1	MW410-1 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.01 U	0.02	0.006 U	0.006 U	NA	NA
MW410-1	MW410-1 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.4 U
MW410-2	MW410-2 [1.5-2.0]	Jul-90	1.5 - 2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
MW410-2	MW410-2 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	0.01 U	0.08	0.005 U	0.005 U	NA	NA
MW410-2	MW410-2 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7
MW410-2	MW410-2 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	0.01 U	0.01	0.005 U	0.005 U	NA	NA
MW410-2	MW410-2 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.6 U
MW410-2	MW410-2 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	0.01 U	0.01	0.006 U	0.006 U	NA	NA
MW410-2	MW410-2 [9.5-10.0]	Jul-90	9.5 - 10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
MW410-2	MW410-2 [12.0-12.5]	Jul-90	12 - 12.5	NA	NA	NA	NA	NA	0.01 U	0.01	0.006 U	0.006 U	NA	NA
MW410-2	MW410-2 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
MW410-2	MW410-2 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	0.01 U	0.01	0.006 U	0.006 U	NA	NA
MW410-2	MW410-2 [15.5-16.0]	Jul-90	15.5 - 16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.6

Notes:

J	Indicates an estimated concentration value	TPH-d	Total petroleum hydrocarbons as diesel
mg/kg	Milligrams per kilogram	TPH-g	Total petroleum hydrocarbons as gasoline
MTBE	Methyl tertiary butyl ether	TPH-mo	Total petroleum hydrocarbons as motor oil
NA	Not analyzed	TTPH	Total total petroleum hydrocarbons (sum of all TPH fractions)
ND	Not detected	U	Indicates compound was analyzed for but not detected above the concentration listed
TPH	Total petroleum hydrocarbon	UJ	Indicates compound was analyzed for but not detected above the estimated concentration listed

TABLE F-3-2: GROUNDWATER ANALYTICAL DATA - SITE 9

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	Concentration (mg/L)										
						TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
154-006-024	154-0038	Oct-95	7.5 - 8.5	915	12	ND	0.1 U	0.05 UJ	0.2 U	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	0.0013 U
154-SN-007	154S-015	Oct-95	9 - 9	825	60.5	**4.5**	1.7 J	0.05 UJ	2.8 J	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	NA
154-SN-008	154S-018	Oct-95	8 - 9	815	33.3	ND	0.1 U	0.05 UJ	0.2 U	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	NA
154-SN-009	154S-021	Oct-95	9 - 9	867	33.5	ND	0.1 U	0.05 UJ	0.2 U	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	NA
3-J	385-S09-036	Jul-01	0	962	0	NA	NA	NA	NA	NA	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
9-1	9-1-10	Jun-02	8 - 12	1,080	25	NA	NA	NA	NA	NA	0.0027	0.00056 J	0.0063	0.0194	0.001 U	
9-1	9-1-20	Jun-02	18 - 22	1,080	25	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.0016	0.0087	0.001 U	NA
9-1	9-1-30	Jun-02	28 - 32	1,080	25	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.00062 J	0.00305 J	0.001 U	NA
9-1	9-1-40	Jun-02	38 - 42	1,080	25	NA	NA	NA	NA	NA	0.001 U	0.00058 J	0.001 U	0.0013	0.001 U	NA
9-2	9-2-10	Jun-02	8 - 10	1,150	20	NA	NA	NA	NA	NA	0.001 U	0.0032	0.004	0.036	0.001 U	NA
9-2	9-2-20	Jun-02	18 - 22	1,150	20	NA	NA	NA	NA	NA	0.001 U	0.00059 J	0.001 U	0.001 U	0.001 U	NA
9-2	9-2-30	Jun-02	28 - 32	1,150	20	NA	NA	NA	NA	NA	0.001 U	0.0054	0.0063	0.063	0.001 U	NA
9-2	9-2-40	Jun-02	38 - 42	1,150	20	NA	NA	NA	NA	NA	0.001 U	0.0011	0.00095 J	0.0101	0.001 U	NA
9-3	9-3-20	Jun-02	18 - 22	1,060	1	NA	NA	NA	NA	NA	0.001 U	0.00052 J	0.001 U	0.001 U	0.001 U	NA
9-3	9-3-30	Jun-02	28 - 32	1,060	1	NA	NA	NA	NA	NA	0.001 U	0.00057 J	0.001 U	0.001 U	0.001 U	NA
9-3	9-3-40	Jun-02	38 - 42	1,060	1	NA	NA	NA	NA	NA	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	NA
9-3	9-3-55	Jul-02	53 - 57	1,060	1	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	NA
9-3	9-3-63	Jul-02	61 - 65	1,060	1	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	NA
9S-CH1	9S-CH1-10	Jun-02	8 - 12	1,150	10	NA	NA	NA	NA	NA	**0.0014**	0.001 U	0.001 U	0.0014	0.001 U	NA
9S-CH1	9S-CH1-20	Jun-02	18 - 22	1,150	10	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	NA
9S-CH1	9S-CH1-30	Jun-02	28 - 32	1,150	10	NA	NA	NA	NA	NA	0.001 U	0.00053 J	0.001 U	0.001 U	0.001 U	NA
9S-CH2	9S-CH2-10	Jun-02	8 - 12	1,150	10	NA	NA	NA	NA	NA	**0.0015**	0.001 U	0.001 U	0.00226 J	0.001 U	NA
9S-CH2	9S-CH2-20	Jun-02	18 - 22	1,150	10	NA	NA	NA	NA	NA	0.001 U	0.00067 J	0.0019	0.0138	0.001 U	NA
9S-CH2	9S-CH2-30	Jun-02	28 - 32	1,150	10	NA	NA	NA	NA	NA	0.001 U	0.0013	0.001 U	0.0019	0.001 U	NA
9S-CH2	9S-CH2-40	Jun-02	38 - 42	1,150	10	NA	NA	NA	NA	NA	0.002 U	0.0011 J	0.0017 J	0.0117	0.002 U	NA
9S-CH3	9S-CH3-10	Jun-02	8 - 12	1,090	30	NA	NA	NA	NA	NA	**0.0054**	0.0007 J	0.12	0.001 U	0.001 U	NA
9S-CH3	9S-CH3-10D	Jun-02	8 - 22	1,090	30	NA	NA	NA	NA	NA	**0.0054**	0.00061 J	0.15	0.001 U	0.001 U	NA
9S-CH3	9S-CH3-20	Jun-02	8 - 12	1,090	30	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.009	0.00318 J	0.001 U	NA
9S-CH3	9S-CH3-30	Jun-02	28 - 32	1,090	30	NA	NA	NA	NA	NA	0.00064 J	0.0023	0.018	0.006	0.001 U	NA
9S-CH3	9S-CH3-40	Jun-02	38 - 42	1,090	30	NA	NA	NA	NA	NA	0.00092 J	0.0017	0.043	0.0094	0.001 U	NA
9S-CH4	9S-CH4-10	Jun-02	8 - 12	1,150	20	NA	NA	NA	NA	NA	**0.0012**	0.0012	0.00052 J	0.0015	0.001 U	NA
9S-CH4	9S-CH4-20	Jun-02	18 - 22	1,150	20	NA	NA	NA	NA	NA	0.001 U	0.0011	0.001 U	0.0013	0.001 U	NA
9S-CH4	9S-CH4-30	Jun-02	28 - 32	1,150	20	NA	NA	NA	NA	NA	0.001 U	0.0016	0.0015	0.007	0.001 U	NA
9S-CH4	9S-CH4-40	Jun-02	38 - 42	1,150	20	NA	NA	NA	NA	NA	0.00058 J	0.0017	0.0017	0.0078	0.001 U	NA
D09-01	280-S09-100	Dec-94	50 - 60	1,060	19.3	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.02 U
D09-01	280-S09-107	Feb-95	50 - 60	1,060	19.3	ND	0.1 U	NA	0.5 U	0.1 U	0.001 UJ	0.001 U	0.001 U	0.001 U	NA	**0.009 J**
D09-01	280-S09-108	Jun-95	50 - 60	1,060	19.3	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0065 U
D09-01	280-S09-109	Sep-95	50 - 60	1,060	19.3	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0022 U
D09-01	108-S09-003	Nov-97	50 - 60	1,060	19.3	NA	NA	NA	NA	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	0.065 U
D09-01	108-S09-004	Feb-98	50 - 60	1,060	19.3	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.003 UJ
D09-01	108-S09-007	May-98	50 - 60	1,060	19.3	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0005 UJ
D09-01	108-S09-010	Aug-98	50 - 60	1,060	19.3	NA	NA	NA	NA	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	0.0017 U
D09-01	385-S09-031	Jun-01	50 - 60	1,060	19.3	ND	0.1 U	0.05 UJ	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
D09-01	D09-01-A1136	Jun-02	50 - 60	1,060	19.3	ND	0.05 UJ	0.04 U	0.3 UJ	0.05 UJ	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.003 U
D09-01	D09-01-A1338	Sep-02	50 - 60	1,060	19.3	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0001 U	NA
D09-01	D09-01-A1637	Dec-02	50 - 60	1,060	19.3	ND	0.05 U	0.05 U	0.3 U	0.05 UJ	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00058 B1
D09-01	D09-01-A1992	Apr-03	50 - 60	1,060	19.3	ND	0.05 U	0.02 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	NA
DHP-S09-01	280-S09-053	Jul-94	25.8	1,030	3.4	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S09-02	280-S09-054	Jul-94	30	1,060	12.1	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S09-03	280-S09-055	Jul-94	24	1,090	67	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.006
DHP-S09-05	280-S09-058	Aug-94	23 - 26	1,100	5	NA	NA	NA	NA	NA	0.0005 U	0.002 U	0.002 U	0.002 U	NA	0.002 UJ

TABLE F-3-2: GROUNDWATER ANALYTICAL DATA - SITE 9

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	Concentration (mg/L)										
						TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
DHP-S09-06	280-S09-059	Sep-94	8 - 11	1,060	2.2	NA	NA	NA	NA	NA	0.01 U	**0.23**	0.086	0.34	NA	0.0012 UJ
DHP-S09-07	280-S09-062	Sep-94	21 - 24	1,120	50.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 UJ
DHP-S09-08	280-S09-064	Sep-94	24	1,260	8	NA	NA	NA	NA	NA	0.0009 J	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S09-09	280-S09-066	Sep-94	22 - 25	1,100	46	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S09-10	280-S09-068	Sep-94	27 - 30	1,185	11.3	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S09-11	280-S09-094	Aug-94	20 - 24	1,300	31	NA	NA	NA	NA	NA	0.0005 U	0.002 U	0.002 U	0.002 U	NA	0.0012 U
DHP-S09-12	280-S09-096	Aug-94	22.5 - 26	1,300	14	NA	NA	NA	NA	NA	0.0005 U	0.002 U	0.002 U	0.002 U	NA	0.0025 UJ
M09-06	280-S09-049	Nov-94	4 - 14	1,160	35	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
M09-06	280-S09-050	Feb-95	4 - 14	1,160	35	0.13	0.13 J	0.05 U	0.5 U	0.1 U	0.001 UJ	0.001 U	0.001 U	0.001 U	NA	0.001 U
M09-06	280-S09-051	Jun-95	4 - 14	1,160	35	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
M09-06	280-S09-052	Aug-95	4 - 14	1,160	35	0.11	0.11 J	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
M09-06	108-S09-001	Nov-97	4 - 14	1,160	35	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.00065 U
M09-06	108-S09-005	Feb-98	4 - 14	1,160	35	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0006 U
M09-06	108-S09-009	May-98	4 - 14	1,160	35	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0005 U
M09-06	108-S09-012	Aug-98	4 - 14	1,160	35	NA	NA	NA	NA	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	0.0017 U
M09-06	385-S09-030	Jun-01	4 - 14	1,160	35	0.04	0.1 U	0.04 J	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MW410-1	MW410-1 [08/21/90]	Aug-90	5 - 15	1,030	1.5	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	**0.088**
MW410-1	280-S09-026	Oct-94	5 - 15	1,030	1.5	0	0 J	0.05 U	1 U	0 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MW410-1	280-S09-028	Jun-95	5 - 15	1,030	1.5	0.24	0.24 J	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MW410-1	280-S09-028	Jun-95	5 - 15	1,030	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0013 U
MW410-1	280-S09-030	Aug-95	5 - 15	1,030	1.5	0.25	0.25 J	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	NA
MW410-1	280-S09-030	Aug-95	5 - 15	1,030	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0011
MW410-1	385-S09-025	Jun-01	5 - 15	1,030	1.5	0.16	0.1 U	0.06 J	0.1	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MW410-1	MW410-1-A1149	Jun-02	5 - 15	1,030	1.5	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 UJ	4.3E-05 J
MW410-1	MW410-1-A1343	Sep-02	5 - 15	1,030	1.5	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	NA
MW410-1	MW410-1-A1650	Dec-02	5 - 15	1,030	1.5	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00037 U
MW410-1	MW410-1-A1996	Apr-03	5 - 15	1,030	1.5	ND	0.05 U	0.02 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	NA
MW410-2	MW410-2 [08/22/90]	Aug-90	5 - 15	1,060	8	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	0.05 U
MW410-2	280-S09-031	Oct-94	5 - 15	1,060	8	0.63	0.1 U	0.06 J	0.57 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.003 U
MW410-2	280-S09-032	Feb-95	5 - 15	1,060	8	0.6	0.1 U	0.05 U	0.6 J	0.1 U	0.001 UJ	0.001 U	0.001 U	0.001 U	NA	0.001 U
MW410-2	280-S09-033	Jun-95	5 - 15	1,060	8	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MW410-2	280-S09-034	Aug-95	5 - 15	1,060	8	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MW410-2	385-S09-026	Jun-01	5 - 15	1,060	8	0.92	0.83 D	0.09 J	0.1 U	0.1 U	0.0009	0.002 U	0.0003 J	0.002 U	**0.02**	NA
MW410-2	MW410-2-A1150	Jun-02	5 - 15	1,060	8	0.09	0.05 U	0.09	0.3 U	0.05 U	0.0009	0.0005 U	0.0005 J	0.0005 U	**0.011 J**	0.0011 J
MW410-2	MW410-2-A1344	Sep-02	5 - 15	1,060	8	0.16	0.05 U	0.16	0.3 U	0.05 U	**0.0012**	0.0004 J	0.0096	0.042	**0.014**	NA
MW410-2	MW410-2-A1651	Dec-02	5 - 15	1,060	8	0.335	0.13	0.11	0.3 U	0.095	**0.0014**	0.0006	0.0047	0.0038	**0.0083**	0.00037 U
MW410-2	MW410-2-A1997	Apr-03	5 - 15	1,060	8	0.097	0.05 U	0.1	0.3 U	0.05 U	0.0009	0.0002 J	0.0008	0.0008 J	0.0042	NA
MW410-3	MW410-3 [08/21/90]	Aug-90	5 - 15	1,096	59	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	**0.09**
MW410-3	280-S09-036	Oct-94	5 - 15	1,096	59	0.89	0.1 U	0.05 U	0.89 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MW410-3	280-S09-037	Feb-95	5 - 15	1,096	59	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 UJ	0.001 U	0.001 U	0.001 U	NA	0.001 U
MW410-3	280-S09-038	Jun-95	5 - 15	1,096	59	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MW410-3	280-S09-038	Jun-95	5 - 15	1,096	59	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0013 U
MW410-3	280-S09-039	Aug-95	5 - 15	1,096	59	ND	0.1 U	0.05 U	0.2 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MW410-3	385-S09-027	Jun-01	5 - 15	1,096	59	ND	0.1 U	0.05 UJ	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MW410-3	385-S09-028	Jun-01	5 - 15	1,096	59	ND	0.1 U	0.05 UJ	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
P-9-IWS-01	SITE9-020	Sep-02	-	1,150	10	NA	NA	NA	NA	NA	**0.002**	0.001 U	0.001 U	0.001 U	0.001 U	0.0028 P
P-9-MWI-01	SITE9-024	Sep-02	-	1,100	10	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U
P-9-MWI-03	SITE9-018	Sep-02	-	1,150	60	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 B
P-9-MWI-04	SITE9-010	Sep-02	-	1,090	80	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0022 B
P-9-MWI-05	SITE9-014	Sep-02	-	1,000	70	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U
P-9-MWI-06	SITE9-008	Sep-02	-	1,000	60	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U

TABLE F-3-2: GROUNDWATER ANALYTICAL DATA - SITE 9

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	Concentration (mg/L)										
						TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
P-9-MWI-07	SITE9-017	Sep-02	-	1,000	60	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U
P-9-MWI-08	SITE9-013	Sep-02	-	1,000	80	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0019 B
P-9-MWI-09	SITE9-015	Sep-02	-	1,100	70	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0028 B
P-9-MWI-10	SITE9-016	Sep-02	-	1,000	70	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.1 U
P-9-MWS-01	SITE9-022	Sep-02	-	1,150	20	NA	NA	NA	NA	NA	**0.0017**	0.001 U	0.0012	0.0026	0.001 U	0.002 B
P-9-MWS-02	SITE9-025	Sep-02	-	1,100	10	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 B
P-9-MWS-03	SITE9-019	Sep-02	-	1,150	10	NA	NA	NA	NA	NA	**0.001** J	0.001 U	0.001 U	0.001 U	0.001 U	0.0028 B
P-9-MWS-04	SITE9-023	Sep-02	-	1,090	80	NA	NA	NA	NA	NA	**0.0056**	0.001 U	0.09	0.009 J	0.001 U	0.0022 B
S09-DGS-DP01	385-S09-001	Jul-01	8 - 10	1,095	0.6	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP01	385-S09-002	Jul-01	15 - 17	1,095	0.6	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP01	385-S09-003	Jul-01	30 - 32	1,095	0.6	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP02	385-S09-004	Jul-01	8 - 10	930	54	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP02	385-S09-005	Jul-01	15	930	54	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP02	385-S09-006	Jul-01	35	930	54	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP02	385-S09-007	Jul-01	45	930	54	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP02	385-S09-008	Jul-01	60	930	54	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP02	385-S09-009	Jul-01	78	930	54	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP03	385-S09-010	Jul-01	10	855	106.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP03	385-S09-011	Jul-01	20	855	106.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP03	385-S09-012	Jul-01	35	855	106.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP03	385-S09-013	Jul-01	43	855	106.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP03	385-S09-014	Jul-01	60	855	106.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP03	385-S09-015	Jul-01	74	855	106.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP04	385-S09-019	Jul-01	50	1,184	33.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP04	385-S09-019A	Jul-01	50	1,184	33.5	NA	NA	NA	NA	NA	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
S09-DGS-DP04	385-S09-020	Jul-01	65	1,184	33.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP04	385-S09-021	Jul-01	80	1,184	33.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP04	385-S09-022	Jul-01	8 - 10	1,184	33.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP04	385-S09-023	Jul-01	15 - 17	1,184	33.5	NA	NA	NA	NA	NA	**0.0017**	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP04	385-S09-024	Jul-01	25 - 27	1,184	33.5	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP05	385-S09-016	Aug-01	7 - 9	1,200	41	NA	NA	NA	NA	NA	**0.001**	0.02	0.055	0.293	0.001 U	NA
S09-DGS-DP05	385-S09-017	Aug-01	15 - 17	1,200	41	NA	NA	NA	NA	NA	**0.0016**	0.0031	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP05	385-S09-017A	Aug-01	15 - 17	1,200	41	NA	NA	NA	NA	NA	**0.002**	0.005	0.0007 J	0.002	0.005 U	NA
S09-DGS-DP05	385-S09-018	Aug-01	25 - 27	1,200	41	NA	NA	NA	NA	NA	0.001 U	0.0048	0.001 U	0.004	0.001 U	NA
S09-DGS-DP07	385-S09-043	Aug-01	7	975	7.3	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP07	385-S09-044	Aug-01	15	975	7.3	NA	NA	NA	NA	NA	0.0009 J	0.001	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP08	385-S09-045	Aug-01	7	910	168	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	**0.0068**	NA
S09-DGS-DP08	385-S09-046	Aug-01	15	910	168	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	**0.04**	NA
S09-DGS-DP08	385-S09-047	Aug-01	30	910	168	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP08	385-S09-048	Aug-01	45	910	168	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP09	385-S09-049	Aug-01	7	1,020	81	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP09	385-S09-050	Aug-01	15	1,020	81	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP09	385-S09-050A	Aug-01	15	1,020	81	NA	NA	NA	NA	NA	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
S09-DGS-DP09	385-S09-051	Aug-01	30	1,020	81	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP09	385-S09-052	Aug-01	45	1,020	81	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP09	385-S09-057	Aug-01	59	1,020	81	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP10	385-S09-054	Aug-01	30	950	102	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP10	385-S09-055	Aug-01	45	950	102	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP10	385-S09-055A	Aug-01	45	950	102	NA	NA	NA	NA	NA	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
S09-DGS-DP10	385-S09-056	Aug-01	58	950	102	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S09-DGS-DP11	385-S09-058	Aug-01	30 - 32	935	98	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA

TABLE F-3-2: GROUNDWATER ANALYTICAL DATA - SITE 9

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	Concentration (mg/L)										
						TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
S09-DGS-DP12	385-S09-059	Sep-01	30 - 32	910	94	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	NA
S09-DGS-VE01	385-S09-034	Aug-01	8.5 - 10	958	2.7	ND	0.2 U	0.05 U	0.2 U	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	NA
SHP-S09-05	280-S09-057	Aug-94	7 - 10	1,100	0.5	NA	NA	NA	NA	NA	0.0005 U	0.0003 J	0.004 J	0.006 J	NA	0.0012 U
SHP-S09-07	280-S09-061	Sep-94	8 - 11	1,120	46	NA	NA	NA	NA	NA	**0.001**	0.007	0.007	0.041	NA	0.0012 U
SHP-S09-08	280-S09-063	Sep-94	11	1,260	3.5	NA	NA	NA	NA	NA	0.0009 J	0.003	0.023	0.056	NA	0.0012 U
SHP-S09-09	280-S09-065	Sep-94	8 - 11	1,100	50	NA	NA	NA	NA	NA	0.01 U	0.034	0.011	0.15	NA	0.0017 UJ
SHP-S09-10	280-S09-067	Sep-94	11	1,186	11	NA	NA	NA	NA	NA	0.1 U	**0.22**	0.12	1.2	NA	**0.0289 J**
SHP-S09-11	280-S09-093	Aug-94	15	1,300	36.3	NA	NA	NA	NA	NA	0.0005 U	0.0002 J	0.002 U	0.002 U	NA	0.0012 U
SHP-S09-12	280-S09-095	Aug-94	8	1,300	17.6	NA	NA	NA	NA	NA	0.0006 U	0.002 U	0.002 U	0.002 U	NA	0.0082 UJ

Notes:

Bold	Indicates preliminary remediation criteria presented in Table F-2-1or free product criteria is exceeded.
D	Resembles a diesel fuel pattern
J	Indicates an estimated concentration value
mg/L	Milligrams per liter
MTBE	Methyl tertiary butyl ether
NA	Not analyzed
ND	Not detected at the total petroleum hydrocarbon detection limits
TPH	Total petroleum hydrocarbon
TPH-d	Total petroleum hydrocarbons as diesel
TPH-g	Total petroleum hydrocarbons as gasoline
TPH-mo	Total petroleum hydrocarbons as motor oil
TTPH	Total total petroleum hydrocarbons (sum of all TPH fractions)
U	Indicates compound was analyzed for but not detected above the concentration listed
UJ	Indicates compound was analyzed for but not detected above the estimated concentration listed

TABLE F-3-3: LOW-RISK FUEL SITE CLOSURE ASSESSMENT CERCLA SITE 9

RWQCB LOW-RISK FUEL SITE CLOSURE CRITERIA	CRITERIA MET	EXPLANATION
The leak and source(s) have been removed	True	Since April 1997, Alameda Point ceased all naval operations, thereby eliminating possible sources of contamination associated with aircraft maintenance and operation activities. In addition, all aboveground storage tanks have been removed from CERCLA Site 9. Floating product (a possible groundwater source) is not present at CERCLA Site 9.
The site has been adequately characterized	True	Multiple investigations that assessed possible TPH contamination were conducted at Site 9 (see Tables F-3-1 and F-3-2). Soil and groundwater have been adequately characterized, and no data gaps were identified during this evaluation.
Little or no groundwater impact currently exists, and no contaminants are found at levels above applicable water quality objectives	True	At Site 9, TPH-associated constituents exceeded PRC for potential exposure to marine ecological receptors through the storm drain exposure pathway. Recent data did not indicate detections exceeding PRC; therefore, corrective action is not warranted for potential exposure to marine ecological receptors through the storm drain exposure pathway.
No water wells, deeper drinking water aquifers, surface water, or other sensitive receptors are likely to be impacted	False	Although no drinking water wells are located within Site 9, and groundwater at Site 9 is greater than 250 feet from the nearest shoreline, groundwater at Site 9 is designated as part of the southeastern region, and is considered a potential drinking water source. TPH-associated constituents exceeded PRC for groundwater as a potential drinking water source; therefore, corrective action may be warranted for groundwater as a potential drinking water source.
The site presents no significant risk to human health	False	Potential reuse for Site 9 includes residential homes mixed with offices, retail, service commercial, research and development, or light industrial areas. TPH-associated constituents in soil exceeded PRC for residential reuse, and TPH-associated constituents in groundwater were screened against residential PRC for volatilization of constituents to indoor air; therefore, the site presents a significant risk to human health.
The site presents no significant risk to the environment	True	The site is located greater than 250 feet from the nearest shoreline. Based on exposure pathways evaluated for marine ecological receptors, TPH-associated constituent concentrations in soil and groundwater samples collected from Site 9 indicate that there is no significant risk to the environment from groundwater discharging to the storm drain.
The dissolved groundwater plume is not migrating	False	Benzene, toluene, and MTBE contaminants exist in the groundwater at Site 9. The samples appear to be located sporadically across the site.

TABLE F-3-3: LOW-RISK FUEL SITE CLOSURE ASSESSMENT CERCLA SITE 9

Notes:

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
OU	Operable Unit
MTBE	Methyl tertiary butyl ether
PRC	Preliminary remediation criteria
RWQCB	Regional Water Quality Control Board
TPH	Total petroleum hydrocarbons
TPH-associated constituents	TPH-diesel range, -gasoline range, -jet fuel range, and -motor oil range; benzene; toluene; ethylbenzene; xylenes; methyl tertiary butyl ether; and lead
TTPH	Total TPH

TABLE F-4-1: SOIL ANALYTICAL DATA - SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
030-S19-001	030-S19-001	Oct-98	0 - 4.5	ND	11 U	0.56 U	11 U	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	2.5 UJ
030-S19-002	030-S19-002	Oct-98	0 - 3	570	110 U	0.55 U	570 J	110 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	6.4
030-S19-003	030-S19-003	Oct-98	0 - 4	360	110 U	0.57 U	360	110 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	18.2
146-SS-001	146M-001M	Feb-95	3 - 4	ND	50 U	50 U	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
147-SS-001	147M-001M	Feb-95	2 - 2.5	ND	50 U	50 U	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
147-SS-002	147M-002M	Feb-95	7 - 8	ND	50 U	50 U	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
147-SS-003	147M-003M	May-95	5.5 - 6.5	2,045	2,000	45	1,500 U	NA	0.029 U	0.029 U	0.029 U	0.029 U	NA	23.8
147-SS-004	147M-004M	Feb-95	6 - 7	ND	50 U	50 U	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
210-IW-001	210I-001	Jan-95	3 - 3.5	200	11 U	0.56 U	200 YJ	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	17.5 J
210-IW-001	210I-001M	Jan-95	3 - 3.5	NA	NA	NA	NA	NA	0.4 U	0.4 U	0.4 U	1.2 U	NA	25 U
210-IW-003	210I-003	Jan-95	5 - 5.5	1,280	960 YJ	320 ZJ	23 U	NA	0.012 U	0.012 U	0.002 J	0.004 J	NA	38 EJ
210-IW-003	210I-003M	Jan-95	5 - 5.5	NA	NA	NA	NA	NA	0.4 U	0.4 U	1.9	1.2 U	NA	26
B-4	18591-1	Oct-89	5.5	ND	10 U	10 U	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	NA	9.3
B-5	18591-3	Oct-89	5	ND	10 U	10 U	NA	NA	0.005 U	0.005 U	0.0026 J	0.0036 J	NA	2.5 U
B-6	18591-4	Oct-89	5.5	ND	10 U	10 U	NA	NA	0.25 U	0.25 U	0.25 U	0.25 U	NA	2.5 U
B-8	18591-6	Oct-89	4.5	ND	10 U	10 U	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	140
B-9	18591-7	Oct-89	5.5	ND	10 U	10 U	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	2.5 U
B-10	18591-8	Oct-89	4.5	ND	10 U	10 U	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	2.5 U
B-11	18606-1	Nov-89	3.5	ND	10 U	10 U	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	2.5 U
B-12	18607-1	Nov-89	5	55	55 J	10 U	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA
B-13	18606-2	Nov-89	3	65	65 J	10 U	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	9.1
B-14	18607-2	Nov-89	4	490	490	100 U	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
B-14	18607-4	Nov-89	15	1,720	860 J	860 J	NA	NA	0.25 U	0.25 U	0.25 U	9.3	NA	NA
B-15	18607-5	Nov-89	5.5	51	51	10 U	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA
B-15	18620-1	Nov-89	5.5	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	3
B-16	18606-3	Nov-89	5	ND	10 U	10 U	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	2.5 U
B-17	18607-6	Nov-89	5.5	ND	10 U	10 U	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA
B13-28	280-S13-001	Dec-94	1 - 2	7,400	230 U	0.57 U	**7,400 J**	230 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	65.7
B13-28	280-S13-002	Dec-94	2.5 - 3.5	803	12 U	760 J	43 J	12 U	0.012 U	0.012 U	0.012 U	0.005 J	NA	3
B13-28	280-S13-003	Dec-94	5.5 - 6	10,860	60 U	9,310 J	1,550 J	60 U	0.06 U	0.06 U	0.021 J	0.062	NA	2.7
B13-29	280-S13-004	Dec-94	1 - 1.5	**70,910**	1,120 U	**1,710 J**	**69,200 J**	1120 U	0.026	0.009 J	0.097	0.24	NA	**378**
B13-29	280-S13-006	Dec-94	2.5 - 3.5	**30,800**	460 U	**3,300 J**	**27,500 J**	460 U	0.082	0.22	0.56	2.8	NA	39.8
B13-29	280-S13-007	Dec-94	5 - 5.5	4,920	62 U	2,750 J	2,170 J	62 U	0.012 U	0.012 U	0.006 J	0.018	NA	4.3
B13-30	280-S13-008	Dec-94	1 - 2	**297,320**	5,810 U	320 J	**297,000 J**	5,810 U	0.012 U	0.012 U	0.012 U	0.012 U	NA	207
B13-30	280-S13-009	Dec-94	2.5 - 3.5	8,330	480 U	780 J	**7,550 J**	480 U	0.003 J	0.005 J	0.003 J	0.021	NA	12.5
B13-30	280-S13-010	Dec-94	5 - 5.5	7,490	120 U	810 J	6,680 J	120 U	0.061 U	0.061 U	5.1	38	NA	3.2
B13-31	280-S13-011	Dec-94	1 - 2	**67,209**	1,160 U	8.8 J	**67,200 J**	1,160 U	0.002 J	0.002 J	0.006 J	0.02	NA	167
B13-31	280-S13-012	Dec-94	2.5 - 3.5	3,340	120 U	140 J	**3,200 J**	120 U	0.012 U	0.012 U	0.097	0.37	NA	3.8
B13-31	280-S13-013	Dec-94	4.5 - 5.5	600	12 U	160 J	440 J	12 U	0.012 U	0.012 U	0.15	0.54	NA	2.5
B13-32	280-S13-015	Aug-94	0.5 - 1.5	57	13 U	0.63 U	57 J	13 U	NA	NA	NA	NA	NA	**431**
B13-32	280-S13-016	Aug-94	2 - 3	1,248.9	12 U	8.9 J	1,240 J	12 U	0.012 U	0.001 J	0.01 J	0.028	NA	79.6
B13-32	280-S13-017	Aug-94	4 - 5	2,920	2,620 J	300 J	1,440 U	570 U	0.011 U	0.008 J	0.16	2.9	NA	3.3
B13-38	ALA13B38-1	Apr-94	0 - 1.5	150	11 U	NA	150 J	NA	NA	NA	NA	NA	NA	3
B13-38	ALA13B38-2	Apr-94	4.5 - 5	19	12 UJ	NA	19 J	NA	NA	NA	NA	NA	NA	32.6
B13-38	ALA13B38-3	Apr-94	10 - 10.5	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	4.8
B13-38	ALA13B38-4	Apr-94	15.5 - 16	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	2.1
B13-39	ALA13B39-1	Apr-94	3 - 3.5	ND	11 U	NA	11 U	NA	NA	NA	NA	NA	NA	1.2
B13-39	ALA13B39-2	Apr-94	8 - 8.5	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	1.8
B13-39	ALA13B39-3	Apr-94	11.5 - 12	64	17 UJ	NA	64 J	NA	NA	NA	NA	NA	NA	22.8
B13-39	ALA13B39-4	Apr-94	14 - 14.5	36	15 UJ	NA	36 J	NA	NA	NA	NA	NA	NA	22.9
B13-39	ALA13B39-5	Apr-94	16 - 16.5	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	2.3

TABLE F-4-1: SOIL ANALYTICAL DATA - SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
B13-40	ALA13B40-1	Apr-94	0.5 - 1	230	12 U	NA	230 J	NA	NA	NA	NA	NA	NA	1.3
B13-40	ALA13B40-2	Apr-94	4.5 - 5	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	1.1
B13-40	ALA13B40-3	Apr-94	9.5 - 10	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	8
B13-40	ALA13B40-4	Apr-94	13 - 13.5	65	14 UJ	NA	65 J	NA	NA	NA	NA	NA	NA	46.9
B13-40	ALA13B40-5	Apr-94	15.5 - 16	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	2.4
B13-41	ALA13B41-1	Apr-94	0.5 - 1	270	210 U	NA	270 J	NA	NA	NA	NA	NA	NA	4.7
B13-41	ALA13B41-2	Apr-94	4.5 - 5	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	1.1
B13-41	ALA13B42-3	Apr-94	6.5 - 7	480	480 J	NA	63 UJ	NA	NA	NA	NA	NA	NA	2.9
B13-41	ALA13B41-3	Apr-94	7 - 7.5	**58,000**	35,000 J	NA	23,000 J	NA	NA	NA	NA	NA	NA	413
B13-41	ALA13B41-4	Apr-94	8 - 8.5	3,400	2,200 J	NA	1,200 J	NA	NA	NA	NA	NA	NA	22.5
B13-41	ALA13B41-5	Apr-94	8.5 - 9	250	13 UJ	NA	250 J	NA	NA	NA	NA	NA	NA	6.5
B13-41	ALA13B41-6	Apr-94	9 - 9.5	**19,800**	12,000 J	NA	7,800 J	NA	NA	NA	NA	NA	NA	150
B13-41	ALA13B41-7	Apr-94	11 - 11.5	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	2.5
B13-41	ALA13B41-8	Apr-94	15 - 15.5	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	1.9
B13-42	ALA13B42-1	Apr-94	3 - 3.5	ND	12 U	NA	12 U	NA	NA	NA	NA	NA	NA	1.1
B13-42	ALA13B42-2	Apr-94	5.5 - 6	4,600	4,600 J	NA	740 UJ	NA	NA	NA	NA	NA	NA	2.7
B13-42	ALA13B42-4	Apr-94	7.5 - 8	653	580 J	NA	73 J	NA	NA	NA	NA	NA	NA	2.1
B13-42	ALA13B42-5	Apr-94	9.5 - 10	736	690 J	NA	46 J	NA	NA	NA	NA	NA	NA	2.5
B13-42	ALA13B42-6	Apr-94	12.5 - 13	1,220	1,000 J	NA	220 J	NA	NA	NA	NA	NA	NA	2.5
B13-42	ALA13B42-7	Apr-94	15.5 - 16	28	28 J	NA	12 UJ	NA	NA	NA	NA	NA	NA	1.8
B13-42	ALA13B42-8	Apr-94	19.5 - 20	11	11 J	NA	12 UJ	NA	NA	NA	NA	NA	NA	1.8
B13-43	ALA13B43-1	Apr-94	3.5 - 4	ND	12 U	NA	12 U	NA	NA	NA	NA	NA	NA	1
B13-43	ALA13B43-2	Apr-94	9.5 - 10	467	380 J	NA	87 J	NA	NA	NA	NA	NA	NA	2.8
B13-43	ALA13B43-3	Apr-94	12 - 12.5	520	450 J	NA	70 J	NA	NA	NA	NA	NA	NA	2.4
B13-43	ALA13B43-4	Apr-94	14.5 - 15	ND	12 UJ	NA	12 UJ	NA	NA	NA	NA	NA	NA	2
B13-44	ALA13B44-1	Apr-94	2 - 2.5	150	11 U	NA	150 J	5.4 U	NA	NA	NA	NA	NA	7.7
B13-44	ALA13B44-2	Apr-94	3.5 - 4	5,200	110 U	NA	**5,200 J**	56 U	NA	NA	NA	NA	NA	64.6
B13-44	ALA13B44-3	Apr-94	6 - 6.5	830	12 U	NA	830 J	5.8 UJ	NA	NA	NA	NA	NA	93.1
B13-44	ALA13B44-4	Apr-94	8.5 - 9	1,400	2,100 UJ	NA	12 U	1,400 J	NA	NA	NA	NA	NA	2
B13-44	ALA13B44-5	Apr-94	11.5 - 12	ND	12 U	NA	12 U	5.9 UJ	NA	NA	NA	NA	NA	2.8
B13-44	ALA13B44-6	Apr-94	14.5 - 15	ND	12 U	NA	12 U	5.9 UJ	NA	NA	NA	NA	NA	2.6
B13-44	ALA13B44-6D	Apr-94	15 - 15.5	ND	12 U	NA	12 U	5.8 UJ	NA	NA	NA	NA	NA	2.5
B-IMF-01	IMF-01-02	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	48.1
B-IMF-01	IMF-01-08	Jul-91	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	148
B-IMF-01	IMF-01-10	Jul-91	9.5 - 10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21.4
B-IMF-02	IMF-02-04	Jul-91	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-IMF-02	IMF-02-06	Jul-91	6 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27.2
B-IMF-02	IMF-02-08	Jul-91	8 - 8.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.3
B-IMF-03	IMF-03-04	Jul-91	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.8
B-IMF-03	IMF-03-08	Jul-91	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.67
B-IMF-03	IMF-03-10	Jul-91	10 - 10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.69
B-IMF-04	IMF-04-06	Jul-91	6 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.95
B-IMF-04	IMF-04-08	Jul-91	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	63.5
B-IMF-05	IMF-05-00	Jul-90	0 - 0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13.7
B-IMF-05	IMF-05-06	Jul-91	6 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.02
B-IMF-06	IMF-06-04	Jul-91	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	602
B-IMF-06	IMF-06-10	Jul-91	10 - 10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.85
B-IMF-07	IMF-07-08	Jul-91	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	30.4
B-IMF-07	IMF-07-10	Jul-91	10 - 10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	52.3
BOR-6	BOR-6 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BOR-6	BOR-6 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	0.006 U	0.008	0.006 U	0.006 U	NA	NA

TABLE F-4-1: SOIL ANALYTICAL DATA - SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
BOR-6	BOR-6 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
BOR-6	BOR-6 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	0.006 U	0.018	0.006 U	0.006 U	NA	NA
BOR-6	BOR-6 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1
BOR-6	BOR-6 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.006 U	0.054	0.006 U	0.006 U	NA	NA
BOR-6	BOR-6 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.5 U
BOR-6	BOR-6 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.013	0.006 U	0.006 U	NA	NA
BOR-6	BOR-6 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-7	BOR-7 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.1 U
BOR-7	BOR-7 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BOR-7	BOR-7 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.011 U	0.26	0.011 U	0.011 U	NA	NA
BOR-7	BOR-7 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.7 U
BOR-7	BOR-7 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	0.006 U	0.009	0.006 U	0.006 U	NA	NA
BOR-7	BOR-7 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.006 U	0.014	0.006 U	0.006 U	NA	NA
BOR-7	BOR-7 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.6
BOR-7	BOR-7 [13.5-14.0]	Jul-90	13.5 - 14	NA	NA	NA	NA	NA	0.006 U	0.036	0.006 U	0.006 U	NA	NA
BOR-7	BOR-7 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.5
BOR-8	BOR-8 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BOR-8	BOR-8 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BOR-8	BOR-8 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	0.006 U	0.025	0.006 U	0.006 U	NA	NA
BOR-8	BOR-8 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BOR-8	BOR-8 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.001 J	0.006 U	0.006 U	NA	NA
BOR-8	BOR-8 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-8	BOR-8 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.006 U	0.004 J	0.006 U	0.006 U	NA	NA
BOR-8	BOR-8 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-8	BOR-8 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.007	0.006 U	0.006 U	NA	NA
BOR-9	BOR-9 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BOR-9	BOR-9 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.006 U	0.017	0.006 U	0.006 U	NA	NA
BOR-9	BOR-9 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.5 U
BOR-9	BOR-9 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	1	1.3	0.72 U	0.72 U	NA	NA
BOR-9	BOR-9 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
BOR-9	BOR-9 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.96	0.75 U	1.8	4.1	NA	NA
BOR-9	BOR-9 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
BOR-9	BOR-9 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.79 U	0.98	0.79 U	0.79 U	NA	NA
BOR-9	BOR-9 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-10	BOR-10 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.1 U
BOR-10	BOR-10 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	0.005 U	0.004 J	0.005 U	0.005 U	NA	NA
BOR-10	BOR-10 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.4 U
BOR-10	BOR-10 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.016	0.006 U	0.006 U	NA	NA
BOR-10	BOR-10 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U
BOR-10	BOR-10 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.009 U	0.11	0.009 U	0.009 U	NA	NA
BOR-10	BOR-10 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	58.5
BOR-10	BOR-10 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.003 J	0.006 U	0.006 U	NA	NA
BOR-10	BOR-10 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
BOR-11	BOR-11 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	64.2
BOR-11	BOR-11 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.038	0.005 U	0.005 U	NA	NA
BOR-11	BOR-11 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BOR-11	BOR-11 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	0.006 U	0.004 J	0.006 U	0.006 U	NA	NA
BOR-11	BOR-11 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-11	BOR-11 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.009 U	0.1	0.009 U	0.009 U	NA	NA
BOR-11	BOR-11 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	59.2
BOR-11	BOR-11 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.01	0.006 U	0.006 U	NA	NA

TABLE F-4-1: SOIL ANALYTICAL DATA - SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
BOR-11	BOR-11 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
BOR-13	BOR-13 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.8
BOR-13	BOR-13 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.0052 U	0.021	0.0052 U	0.0052 U	NA	NA
BOR-13	BOR-13 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BOR-13	BOR-13 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	0.0061 U	0.026	0.0061 U	0.0061 U	NA	NA
BOR-13	BOR-13 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.3 U
BOR-13	BOR-13 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.0052 U	0.037	0.0052 U	0.0052 U	NA	NA
BOR-13	BOR-13 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-13	BOR-13 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.029	0.006 U	0.006 U	NA	NA
BOR-13	BOR-13 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U
BOR-14	BOR-14 [0.0-0.5]	May-90	0 - 0.5	ND	11 U	NA	NA	NA	NA	NA	NA	NA	NA	5.4 U
BOR-14	BOR-14 [4.0-4.5]	May-90	4 - 4.5	ND	12 U	NA	NA	NA	NA	NA	NA	NA	NA	6.3 U
BOR-14	BOR-14 [6.0-6.5]	May-90	6 - 6.5	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA
BOR-14	BOR-14 [8.0-8.5]	May-90	8 - 8.5	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA
BOR-14	BOR-14 [8.5-9.0]	May-90	8.5 - 9	ND	12 U	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U
BOR-14	BOR-14 [13.0-13.5]	May-90	13 - 13.5	NA	NA	NA	NA	NA	0.0062 U	0.0062 U	0.0062 U	0.0062 U	NA	NA
BOR-14	BOR-14 [14.0-14.5]	May-90	14 - 14.5	ND	13 U	NA	NA	NA	NA	NA	NA	NA	NA	6.4 U
BOR-15	BOR-15 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14.1
BOR-15	BOR-15 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.63 U	1.6	0.63 U	0.63 U	NA	NA
BOR-15	BOR-15 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.5 U
BOR-15	BOR-15 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	0.006 U	0.013	0.006 U	0.006 U	NA	NA
BOR-15	BOR-15 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.3
BOR-15	BOR-15 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.002 J	0.014	0.01	0.027	NA	NA
BOR-15	BOR-15 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
BOR-15	BOR-15 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.005 J	0.006 U	0.006 U	NA	NA
BOR-15	BOR-15 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BOR-16	BOR-16 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**260**
BOR-16	BOR-16 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.005 U	0.057	0.005 U	0.005 U	NA	NA
BOR-16	BOR-16 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.7
BOR-16	BOR-16 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	0.006 U	0.015	0.006 U	0.006 U	NA	NA
BOR-16	BOR-16 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-16	BOR-16 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.006 U	0.027	0.006 U	0.006 U	NA	NA
BOR-16	BOR-16 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-16	BOR-16 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.012	0.006 U	0.006 U	NA	NA
BOR-16	BOR-16 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.3 U
BOR-17	BOR-17 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.4 U
BOR-17	BOR-17 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.011 U	0.32 BD	0.011 U	0.011 U	NA	NA
BOR-17	BOR-17 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18.6
BOR-17	BOR-17 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.015	0.006 U	0.006 U	NA	NA
BOR-17	BOR-17 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.1
BOR-17	BOR-17 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	2.9 U	2.9 U	1.4 J	2.9 U	NA	NA
BOR-17	BOR-17R [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.7 U
BOR-17	BOR-17 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.4
BOR-17	BOR-17 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.01	0.013	0.005 J	0.006 U	NA	NA
BOR-17	BOR-17 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.1
BOR-18	BOR-18 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50
BOR-18	BOR-18 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	0.007 U	0.062	0.007 U	0.007 U	NA	NA
BOR-18	BOR-18 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
BOR-18	BOR-18 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.007 U	0.036	0.007 U	0.007 U	NA	NA
BOR-18	BOR-18 [7.5-8.0]	Jul-90	7.5 - 8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
BOR-18	BOR-18 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.006 U	0.026	0.006 U	0.006 U	NA	NA

TABLE F-4-1: SOIL ANALYTICAL DATA - SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
BOR-18	BOR-18 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-18	BOR-18 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.038	0.006 U	0.006 U	NA	NA
BOR-18	BOR-18 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BOR-19	BOR-19 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BOR-19	BOR-19 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA
BOR-19	BOR-19 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
BOR-19	BOR-19 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.04	0.006 U	0.006 U	NA	NA
BOR-19	BOR-19 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.7
BOR-19	BOR-19 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.36 J	0.29 J	1.5	0.74 U	NA	NA
BOR-19	BOR-19 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-19	BOR-19 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.006	0.006 U	0.006 U	NA	NA
BOR-19	BOR-19 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-21	BOR-21 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.8
BOR-21	BOR-21 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.018	0.005 U	0.005 U	NA	NA
BOR-21	BOR-21 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.8
BOR-21	BOR-21 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.001 JB	0.006 U	0.006 U	NA	NA
BOR-21	BOR-21 [7.5-8.0]	Jul-90	7.5 - 8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.8
BOR-21	BOR-21 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.75 U	0.75 U	0.75 U	0.75 U	NA	NA
BOR-21	BOR-21 [12.0-12.5]	Jul-90	12 - 12.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2
BOR-21	BOR-21 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.002 J	0.005 J	0.006 U	NA	NA
BOR-21	BOR-21 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.3
BOR-24	BOR-24 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	36.3
BOR-24	BOR-24 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA
BOR-24	BOR-24 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.5 U
BOR-24	BOR-24 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.002 J	0.006 U	0.006 U	NA	NA
BOR-24	BOR-24 [7.5-8.0]	Jul-90	7.5 - 8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12.4
BOR-24	BOR-24 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA
BOR-24	BOR-24 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.5
BOR-24	BOR-24 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.003 J	0.006 U	0.006 U	NA	NA
BOR-24	BOR-24 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.8
CA13-11	030-CAP-205	May-00	3 - 4	10,931	850	1.3	**10,000**	80	0.088	0.11	0.035	0.27	0.01 U	42
CA13-11	030-CAP-206	May-00	7 - 8	40	10 U	40 J	250 U	10 U	0.01 U	0.01 U	0.13	0.56	0.01 U	11 U
CA13-12	030-CAP-207	May-00	3 - 4	ND	10 U	0.5 U	250 U	10 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	11 U
CA13-12	030-CAP-378	May-00	4 - 4.5	ND	10 U	0.5 U	250 U	10 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	140
CA13-12	030-CAP-208	May-00	4.5 - 5.3	6,979	1,100	9.1 J	5,700	170	0.29	0.11	0.055	0.56	0.01 U	75
CA13-13	030-CAP-209	May-00	2.8 - 3.8	ND	10 U	0.5 UJ	250 U	10 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	12 UJ
CA13-13	030-CAP-210	May-00	4.5 - 5.5	3,072	390 J	0.5 U	2,600 J	82 J	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	12 UJ
CA13-14	030-CAP-211	May-00	3 - 4	ND	10 U	0.5 U	250 U	10 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	11 U
CA13-14	030-CAP-212	May-00	7.5 - 8	ND	10 U	0.5 U	250 U	10 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	12 U
CA13-15	030-CAP-214	May-00	3 - 4	7,131	480	11 J	**6,500**	140	0.062	0.085	0.055	1.7 U	0.2 U	99
CA13-15	030-CAP-213	May-00	4 - 5	12,542	1,800	22	10,000	720	0.23	0.57	0.23	11	0.2 U	280
CA13-16	030-CAP-215	May-00	1.5 - 2.5	2,694	380	0.5 U	**2,300**	14	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	74
CA13-16	030-CAP-216	May-00	4 - 5	2,444	120	0.5 UJ	2,300	24	0.033	0.016	0.0094	0.046	0.01 U	62
CA13-17	030-CAP-217	Jun-00	3 - 3.5	**66,003**	**36,000**	2.9 J	**30,000**	NA	0.043	0.012 U	0.012 J	0.024	0.01 U	54
CA13-17	030-CAP-218	Jun-00	4 - 4.5	**41,200**	18,000	200 J	23,000	NA	0.0071 J	0.011 U	0.011 U	0.0191 UJ	0.01 U	94
CA13-18	030-CAP-219	Jun-00	3 - 3.5	1,090	400 J	1.1 U	690	NA	0.011 U	0.011 U	0.011 U	0.022 U	0.01 U	5
CA13-18	030-CAP-220	Jun-00	4 - 4.5	730	270 J	1.2 U	460	NA	0.012 U	0.012 U	0.012 U	0.024 U	0.01 U	3.2
CA13-19	030-CAP-221	Jun-00	3 - 3.5	ND	1.1 U	1.1 U	11 U	NA	0.011 U	0.011 U	0.011 U	0.022 U	0.01 U	1.2
CA13-19	030-CAP-222	Jun-00	4 - 4.5	133	33 J	1.2 U	100	NA	0.011 U	0.011 U	0.011 U	0.022 U	0.01 U	8.1
CA13-20	030-CAP-223	Jun-00	3 - 3.5	**36,003**	**20,000**	2.5 J	**16,000**	NA	0.098 J	0.1 J	0.045 J	0.266 J	0.01 U	55
CA13-20	030-CAP-224	Jun-00	6.5 - 7	266	120	26 J	120	NA	0.061 U	0.061 U	0.39	0.591 U	0.06 U	2.5

TABLE F-4-1: SOIL ANALYTICAL DATA - SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
CA13-21	030-CAP-411	Jun-00	3.5 - 4	**58,300**	**30,000**	**1,300 J**	**27,000**	NA	0.052 U	0.052 U	0.035 J	0.164 J	0.05 U	74
CA13-21	030-CAP-412	Jun-00	5.5 - 6	**14,900**	7,400	1400 J	6,100	NA	0.012 U	0.012 U	0.025	0.103	0.01 U	3.1
CA13-22	030-CAP-414	Jun-00	4 - 4.5	**38,083**	18,000	83 J	20,000	NA	0.056 J	0.11 J	0.099 J	0.4 J	0.05 U	5.6
CA13-22	030-CAP-415	Jun-00	7.5 - 8	**27,027**	13,000	27 J	14,000	NA	0.012 U	0.012 U	0.012 U	0.091 J	0.01 U	2.6
CA13-23	030-CAP-417	Jun-00	3.5 - 4	2,870	1,200	750 J	920	NA	0.12	0.083	0.4	1.95	0.06 U	12 U
CA13-23	030-CAP-418	Jun-00	5 - 6.5	6,323	3,300	23 J	3,000	NA	0.023 U	0.023 U	0.07 J	0.188 J	0.02 U	15
CA13-24	030-CAP-420	Jun-00	2.5 - 3	ND	1.1 U	0.53 U	11 U	NA	0.011 U	0.011 U	0.011 U	0.022 U	0.01 U	11 U
CA13-24	030-CAP-421	Jun-00	4 - 4.5	260	130	0.53 U	130	NA	0.011 U	0.011 U	0.011 U	0.022 U	0.01 U	11 U
CA13-25	030-CAP-424	Jun-00	3.5 - 4	4.7	4.7 J	1.2 U	12 U	NA	0.011 U	0.011 U	0.011 U	0.022 U	0.01 U	1.9
CA13-25	030-CAP-425	Jun-00	4.5 - 5	29	11 J	1.2 U	18	NA	0.012 U	0.012 U	0.012 U	0.024 U	0.01 U	3.7
CA13-26	030-CAP-427	Jun-00	3.5 - 4.5	660	280 J	380 J	11 U	NA	0.012 U	0.012 U	0.012 U	0.024 U	0.01 U	11 U
CA13-26	030-CAP-428	Jun-00	6.5 - 7	1,310	210 J	1,100 J	22 U	NA	0.022 U	0.022 U	0.022 U	0.044 U	0.02 U	21 U
EX13-002	137-S13-002	Oct-93	5	200	200	2.8 U	NA	11 U	0.0015 J	0.0045 J	0.00066 J	0.0054 J	NA	24.9
EX13-003	137-S13-003	Oct-93	5	15	15	2.8 U	NA	11 U	0.0004 J	0.0012	0.00034 U	0.002	NA	1.4
EX13-004	137-S13-004	Oct-93	5	180	180	3.4 U	NA	14 U	0.031 J	0.0089 J	0.024 J	0.012 J	NA	13.3
EX13-006	137-S13-006	Oct-93	4	1,607	**1,600**	6.6	NA	260 U	0.001 J	0.0013 J	0.00069 J	0.0011 J	NA	36.7
EX13-007	137-S13-007	Oct-93	4	NA	NA	NA	NA	NA	0.0025 J	0.0034 J	0.0026 J	0.0031 J	NA	NA
EX13-007	137-S13-007	Oct-93	4	91	91	3.9 U	NA	15 U	0.015 U	0.015 U	0.015 U	0.015 U	NA	14.3
EX13-007	137-S13-010	Oct-93	4	NA	NA	NA	NA	NA	0.004 J	0.023 J	0.0087 J	0.096 J	NA	NA
EX13-007	137-S13-010	Oct-93	4	5,812	**5,800**	12	NA	2200 U	0.002 J	0.027	0.008 J	0.12	NA	68.4
EX13-008	137-S13-008	Oct-93	4	418.2	410	8.2	NA	250 U	0.0047 J	0.016 J	0.015 J	0.077 J	NA	23.8
EX13-009	137-S13-009	Oct-93	7	8,640	7,800	840	NA	2400 U	0.27	9.1 J	0.22 J	32 J	NA	104
EX13-009	137-S13-009	Oct-93	7	NA	NA	NA	NA	NA	0.65 J	3.3 J	1.1 J	9.4 J	NA	NA
EX13-020	137-S13-020	Oct-94	7	ND	1.4 UJ	1.5 U	14 UJ	1.4 U	0.075 U	0.075 U	0.075 U	0.075 U	NA	11.1
EX13-021	137-S13-021	Oct-94	5	ND	1.3 UJ	1.3 U	13 UJ	1.3 U	0.064 U	0.064 U	0.064 U	0.064 U	NA	20.5
EX13-022	137-S13-022	Oct-94	5	ND	1.4 UJ	1.7 U	14 UJ	1.4 U	0.083 U	0.083 U	0.083 U	0.083 U	NA	13.5
EX13-023	137-S13-023	Oct-94	5	ND	1.4 UJ	NA	14 UJ	1.4 U	0.001 J	0.014 U	0.014 U	0.014 U	NA	8.5
EX13-023	137-S13-023	Oct-94	5	ND	NA	1.3 U	NA	NA	0.066 U	0.066 U	0.066 U	0.066 U	NA	NA
EX13-024	137-S13-024	Oct-94	5	ND	1.4 UJ	1.4 U	14 UJ	1.4 U	0.068 U	0.068 U	0.068 U	0.068 U	NA	121
M07C-06	280-S7C-017	Aug-94	0.5 - 1.5	1,470.6	55 U	0.6 J	1,470 J	55 U	0.011 U	0.011 UJ	0.011 UJ	0.011 U	NA	17.1 J
M07C-06	280-S7C-018	Aug-94	2.5 - 3.5	990	56 U	0.56 UJ	990 J	56 U	0.013 U	0.06 UJ	0.013 UJ	0.052 U	NA	3.8 J
M07C-06	280-S7C-019	Aug-94	5 - 6	130	12 U	0.59 UJ	130 J	12 U	0.012 UJ	0.012 UJ	0.012 UJ	0.012 UJ	NA	2.8 J
M07C-09	280-S7C-095	Aug-94	0.5 - 1.5	310	11 U	0.53 U	310 J	11 U	NA	NA	NA	NA	NA	9.3
M07C-09	280-S7C-096	Aug-94	2.5 - 3.5	110	11 U	0.56 U	110 J	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	13.8
M07C-09	280-S7C-097	Aug-94	5 - 6	ND	14 U	0.72 U	26 U	14 U	0.014 U	0.014 U	0.014 U	0.014 U	NA	4
M13-06	280-S13-018	Aug-94	0 - 1	ND	10 U	0.51 U	25 U	10 U	NA	NA	NA	NA	NA	1.6
M13-06	280-S13-019	Aug-94	2.5 - 3.5	ND	10 U	0.52 U	26 U	10 U	0.01 U	0.01 U	0.01 U	0.01 U	NA	1.5
M13-06	280-S13-020	Aug-94	4 - 5	ND	12 U	0.59 U	30 U	12 U	0.012 U	0.012 U	0.012 U	0.012 U	NA	1.5
M13-07	280-S13-021	Aug-94	0 - 1	ND	10 U	0.51 U	25 U	10 U	NA	NA	NA	NA	NA	2.9
M13-07	280-S13-022	Aug-94	1.5 - 2.5	ND	10 U	0.52 U	26 U	10 U	0.01 U	0.01 U	0.01 U	0.01 U	NA	1.8
M13-07	280-S13-023	Aug-94	2.5 - 3.5	ND	12 U	0.6 U	30 U	12 U	0.012 U	0.012 U	0.012 U	0.012 U	NA	1.7
M13-07	280-S13-024	Aug-94	4.5 - 5.5	ND	13 U	0.64 U	32 U	13 U	0.013 U	0.001 J	0.013 U	0.013 U	NA	3.5
M13-08	280-S13-025	Nov-94	1 - 2	ND	11 U	0.56 U	22 U	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	2.7
M13-08	280-S13-026	Nov-94	2.5 - 3.5	38	12 U	0.6 U	38 J	12 U	0.012 U	0.012 U	0.012 U	0.012 U	NA	2.2
M13-08	280-S13-027	Nov-94	5 - 6	ND	12 U	0.59 U	24 U	12 U	0.012 U	0.012 U	0.012 U	0.012 U	NA	1.8
M13-09	280-S13-028	Nov-94	1 - 2	83	11 U	0.57 U	83 J	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	6.5
M13-09	280-S13-029	Nov-94	2.5 - 3.5	430	12 U	0.6 U	430 J	12 U	0.012 U	0.012 U	0.012 U	0.012 U	NA	1.8
M13-09	280-S13-030	Nov-94	5 - 6	750	12 U	220 J	530 J	12 U	0.012 U	0.012 U	0.012 U	0.012 U	NA	2.5
MWOR-1	MWOR-1 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
MWOR-1	MWOR-1 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.014 U	0.45	0.014 U	0.014 U	NA	NA
MWOR-1	MWOR-1 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.4 U

TABLE F-4-1: SOIL ANALYTICAL DATA - SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
MWOR-1	MWOR-1 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.013	0.006 U	0.006 U	NA	NA
MWOR-1	MWOR-1 [7.5-8.0]	Jul-90	7.5 - 8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
MWOR-1	MWOR-1 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.006 U	0.01	0.006 U	0.006 U	NA	NA
MWOR-1	MWOR-1 [12.0-12.5]	Jul-90	12 - 12.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
MWOR-1	MWOR-1 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	0.006 U	0.012	0.006 U	0.006 U	NA	NA
MWOR-1	MWOR-1 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
MWOR-2	MWOR-2 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.4 U
MWOR-2	MWOR-2 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA
MWOR-2	MWOR-2 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.4 U
MWOR-2	MWOR-2 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.008	0.006 U	0.006 U	NA	NA
MWOR-2	MWOR-2 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
MWOR-2	MWOR-2 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	0.006 U	0.005 J	0.006 U	0.006 U	NA	NA
MWOR-2	MWOR-2 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.6
MWOR-2	MWOR-2 [12.0-12.5]	Jul-90	12 - 12.5	NA	NA	NA	NA	NA	0.006 U	0.002 J	0.006 U	0.006 U	NA	NA
MWOR-2	MWOR-2 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
MWOR-3	MWOR-3 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
MWOR-3	MWOR-3 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.046	0.005 U	0.005 U	NA	NA
MWOR-3	MWOR-3 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
MWOR-3	MWOR-3 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.032	0.006 U	0.006 U	NA	NA
MWOR-3	MWOR-3 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.7 U
MWOR-3	MWOR-3 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	0.006 U	0.008	0.006 U	0.006 U	NA	NA
MWOR-3	MWOR-3 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
MWOR-3	MWOR-3 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.006 U	0.012	0.006 U	0.006 U	NA	NA
MWOR-3	MWOR-3 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.6
MWOR-4	MWOR-4 [1.5-2.0]	Jul-90	1.5 - 2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.1
MWOR-4	MWOR-4 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.043	0.005 U	0.005 U	NA	NA
MWOR-4	MWOR-4 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10
MWOR-4	MWOR-4 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA
MWOR-4	MWOR-4 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.2
MWOR-4	MWOR-4 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	0.006 U	0.002 J	0.006 U	0.006 U	NA	NA
MWOR-4	MWOR-4 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.9
MWOR-4	MWOR-4 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA
MWOR-4	MWOR-4 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.5

Notes:

Bold	Indicates preliminary remediation criteria presented in Table F-2-1or free product criteria is exceeded.
J	Indicates an estimated concentration value
U	Indicates compound was analyzed for but not detected above the concentration listed
UJ	Indicates compound was analyzed for but not detected above the estimated concentration listed
mg/kg	Milligrams per kilogram
MTBE	Methyl tertiary butyl ether
NA	Not analyzed
ND	Not detected at the total petroleum hydrocarbon detection limits
TPH-d	Total petroleum hydrocarbons as diesel
TPH-g	Total petroleum hydrocarbons as gasoline
TPH-mo	Total petroleum hydrocarbons as motor oil
TTPH	Total total petroleum hydrocarbons (sum of all TPH factions)
Y	Sample exhibits fuel pattern which does not resemble standard

TABLE F-4-2: GROUNDWATER ANALYTICAL DATA - SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

						Concentration (mg/L)										
Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
13GB005	GPW13-500	Aug-94	5 - 6	1,120	43	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
13GB100	GPW13-100	Aug-94	5 - 6	1,522	175	ND	0.1 U	0.05 U	0.5 U	0.2 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
B13-28	280-S13-106	Dec-94	6 - 6.5	1,650	30	**26**	20 J	6	2.5 U	0.5 U	0.001 U	0.001 U	0.13	0.53	NA	NA
B13-29	280-S13-146	Dec-94	5.5 - 6	1,650	31	**51.2**	49 J	2.2 J	10 U	2 U	**0.021**	0.008	0.052	0.24	NA	NA
B13-30	280-S13-108	Dec-94	5.5 - 6	1,900	160	**90.5**	88 J	2.5 J	10 U	2 U	**0.18**	0.008	0.026	0.1	NA	NA
B-IMF-09	B-IMF-09	Apr-92	6	1,500	166	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1.77**
B-IMF-10	B-IMF-10	Apr-92	10 - 10.5	1,520	160	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.0765**
CA13-01	030-CAP-187	Apr-00	0 - 10	1,900	160	**3.7**	0.6 J	3.1 J	0.5 U	NA	0.0005 U	0.001 U	0.001 U	0.0005 J	0.002 UJ	0.003 U
CA13-02	030-CAP-188	May-00	0 - 10	1,335	5	**1.48**	1.1 J	0.38 J	0.5 U	NA	0.0005 U	0.001 U	0.0011	0.0006 J	0.002 U	0.003 U
CA13-04	030-CAP-189	Jun-00	0 - 10	1,312	20	**6.88**	5.6 J	0.76 J	0.52	NA	0.0005	0.001 U	0.001 U	0.002 U	0.002 U	0.003 U
CA13-05	030-CAP-423	Jun-00	0 - 10	1,340	7	0.93	NA	0.93 J	NA	NA	0.0005 U	0.001 U	0.0008 J	0.0021 U	0.002 U	NA
CA13-05	030-CAP-423A	Jun-00	0 - 10	1,340	7	0.44	0.44 J	NA	0.5 U	NA	NA	NA	NA	NA	NA	0.003 U
CA13-11	030-CAP-225	May-00	0 - 10	1,650	23	**93.75**	0.42	0.94	92	0.39	**0.12**	0.0079	0.015	0.042	0.002 U	0.003 U
CA13-12	030-CAP-226	May-00	0 - 10	1,650	7	**27.1**	1.5	8.2	16	1.4	**1.1**	0.056	0.096	0.45	0.01 U	0.003 U
CA13-13	030-CAP-227	May-00	2.5 - 7.5	1,650	3	**24.62**	2.8	1.2	20	0.62	**0.22**	0.065	0.0081	0.055	0.002 UJ	0.0035 J
CA13-14	030-CAP-228	May-00	3 - 8	1,650	2	**6.96**	3.9	0.05 U	2.4	0.66	**0.0014**	0.001	0.001 U	0.0042	0.002 U	0.003 U
CA13-15	030-CAP-229	May-00	3 - 8	1,650	15	**100.9**	7.1	4.5	88	1.3	**1.1**	0.02 U	0.02 U	0.11	0.04 UJ	**0.023**
CA13-16	030-CAP-230	May-00	3 - 8	1,650	17	**10.43**	0.62	1.7	7.7	0.41	**0.23**	0.01 U	0.018	0.016	0.02 UJ	**0.086**
CA13-17	030-CAP-231	Jun-00	3 - 8	1,650	13	**67.3**	31	2.3	34	NA	**1.4**	0.0097 J	0.085	0.196	0.02 U	0.003 U
CA13-18	030-CAP-232	Jun-00	3 - 8	1,650	6	1	0.45	0.11 UJ	0.55	NA	0.0005 U	0.001 U	0.001 U	0.002 U	0.002 U	0.003 U
CA13-19	030-CAP-233	Jun-00	3 - 8	1,650	21	0.32	0.32	0.05 U	0.5 U	NA	0.0005 U	0.001 U	0.001 U	0.002 U	0.002 U	0.003 U
CA13-20	030-CAP-234	Jun-00	3 - 8	1,650	14	**77.1**	44	1.1 J	32	NA	**0.11**	0.0063	0.036	0.0615	0.002 U	**0.077**
CA13-21	030-CAP-413	Jun-00	3 - 8	1,650	29	**18.4**	10	0.26 UJ	8.4	NA	0.0025 U	0.005 U	0.005 U	0.006	0.01 U	0.003 U
CA13-22	030-CAP-416	Jun-00	3 - 8	1,650	35	**1091**	510	11	570	NA	**0.026**	0.015	0.0056 J	0.035	0.02 U	0.003 U
CA13-23	030-CAP-419	Jun-00	3 - 8	1,650	28	**6.9**	1.2	5.7 J	0.5 U	NA	**0.024**	0.011	0.034	0.141	0.008 U	0.003 U
CA13-24	030-CAP-422	Jun-00	3 - 8	1,650	40	**81.7**	6.6	72 J	3.1	NA	0.0028 U	0.0056 U	0.021	0.083	0.011 U	0.003 U
CA13-25	030-CAP-426	Jun-00	3 - 8	1,650	2	**13.4**	5.7	1.5 J	6.2	NA	**0.011**	0.004	0.016	0.059	0.002 U	0.003 U
CA13-26	030-CAP-429	Jun-00	3 - 8	1,300	43	**17.5**	8.9 J	8.6 J	0.5 U	NA	0.0005 U	0.001 U	0.001 U	0.002 U	0.002 U	0.003 U
D13-01	280-S13-100	Dec-94	50 - 60	1,751	199	ND	0.1 U	0.05 U	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
D13-01	280-S13-111	Feb-95	50 - 60	1,751	199	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
D13-01	280-S13-112	Jun-95	50 - 60	1,751	199	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
D13-01	280-S13-113	Sep-95	50 - 60	1,751	199	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
D13-01	385-S13-011	Jun-01	50 - 60	1,751	199	ND	0.1 U	0.05 U	0.1 U	NA	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
D13-01	D13-01-A1138	Jul-02	50 - 60	1,751	199	ND	0.05 UJ	0.05 U	0.3 UJ	0.05 UJ	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.003 U
D13-01	D13-01-A1639	Dec-02	50 - 60	1,751	199	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00031 U
DHP-S13-02	280-S13-073	Aug-94	17.9	1,735	24	1.37	0.1 U	0.05 U	1.37 J	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
DHP-S13-03	280-S13-074	Jul-94	22	2,100	229	**2.27**	0.1 U	0.05 U	2.27 J	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
DHP-S13-04	280-S13-075	Jul-94	30	1,761	200	**2.1**	0.1 U	0.05 U	2.1 J	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
M07C-06	280-S7C-049	Nov-94	4 - 14	1,840	140	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
M07C-06	280-S7C-050	Feb-95	4 - 14	1,840	140	0.67	0.1 U	0.05 U	0.67 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.002 U
M07C-06	280-S7C-051	Jun-95	4 - 14	1,840	140	0.44	0.44 J	0.05 U	0.2 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
M07C-06	280-S7C-053	Aug-95	4 - 14	1,840	140	0.48	0.48 J	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
M07C-06	385-S22-006	Jul-01	4 - 14	1,840	140	0.51	0.1 U	0.03 J	0.48	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
M07C-06	M07C-06-A1139	Jun-02	4 - 14	1,840	140	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0001 U	0.00017 J
M07C-06	M07C-06-A1339	Sep-02	4 - 14	1,840	140	ND	0.05 U	0.02 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0002 U	NA
M07C-06	M07C-06-A1640	Dec-02	4 - 14	1,840	140	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00024 U
M07C-06	M07C-06-A1993	Apr-03	4 - 14			ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	NA
M07C-09	280-S7C-062	Nov-94	4 - 14	1,690	14	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
M07C-09	280-S7C-063	Feb-95	4 - 14	1,690	14	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.001 U
M07C-09	280-S7C-064	Jun-95	4 - 14	1,690	14	0.39	0.1 U	0.05 U	0.39 J	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
M07C-09	280-S7C-065	Aug-95	4 - 14	1,690	14	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U

TABLE F-4-2: GROUNDWATER ANALYTICAL DATA - SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

						Concentration (mg/L)										
Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
M07C-09	030-CAP-065	Apr-00	4 - 14	1,690	14	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	0.002 U	NA
M07C-09	385-S22-009	Jul-01	4 - 14	1,690	14	0.68	0.1 U	0.03 J	0.65	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
M07C-09	MW7C-09-A1141	Jun-02	4 - 14	1,690	14	0.44	0.15	0.05 U	0.29 J	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.000022 U
M07C-09	MW7C-09-A1141	Jun-02	4 - 14	1,690	14	0.44	0.15	0.05 U	0.29 J	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.000022 U
M07C-09	M07C-09-A1340	Sep-02	4 - 14	1,690	14	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0001 U	NA
M07C-09	M07C-09-A1642	Dec-02	4 - 14	1,690	14	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00028 U
M07C-09	M07C-09-A1994	Apr-03	4 - 14	1,690	14	ND	0.05 U	0.02 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	NA
M13-06	280-S13-054	Oct-94	2 - 9.75	1,380	163	**1.75**	0.1 U	0.05 U	1.75 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
M13-06	280-S13-055	Feb-95	2 - 9.75	1,380	163	1.1	0.1 U	0.05 U	1.1 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.001 U
M13-06	280-S13-057	Jun-95	2 - 9.75	1,380	163	0.74	0.1 U	0.05 U	0.74 J	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
M13-06	280-S13-058	Aug-95	2 - 9.75	1,380	163	0.92	0.1 U	0.05 U	0.92 J	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
M13-06	108-S13-001	Nov-97	2 - 9.75	1,380	163	0.3	0.1 UJ	0.05 U	0.3	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.00065 U
M13-06	108-S13-005	Feb-98	2 - 9.75	1,380	163	ND	0.12 UJ	0.05 U	0.25 UJ	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.00062 UJ
M13-06	108-S13-009	May-98	2 - 9.75	1,380	163	ND	0.12 U	0.05 U	0.25 U	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0005 U
M13-06	108-S13-013	Aug-98	2 - 9.75	1,380	163	ND	NA	0.05 UJ	NA	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 U	NA	0.0017 U
M13-06	385-S13-006	Jun-01	2 - 9.75	1,380	163	0.77	0.1 U	0.05 U	0.77	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
M13-06	M13-06-A1144	Jun-02	2 - 9.75	1,380	163	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 UJ	0.00013 J
M13-06	M13-06-A1645	Dec-02	2 - 9.75	1,380	163	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00023 U
M13-07	280-S13-059	Nov-94	2.5 - 12.5	1,780	40	**8.73**	6.16 J	2.57 J	0.8 U	0.4 U	**0.086**	0.005 U	0.004 J	0.005 U	NA	0.0015 U
M13-07	280-S13-060	Feb-95	2.5 - 12.5	1,780	40	**2.24**	1.5 J	0.74 J	0.5 U	0.1 U	**0.011** J	0.001 U	0.001	0.0009 J	NA	0.001 U
M13-07	280-S13-061	Jun-95	2.5 - 12.5	1,780	40	**2.22**	1.8 J	0.42 J	0.5 U	0.1 U	**0.023**	0.001 U	0.002	0.001 U	NA	0.0013 U
M13-07	280-S13-062	Aug-95	2.5 - 12.5	1,780	40	**3.36**	2.8 J	0.56 J	0.5 U	0.1 U	**0.044**	0.001 U	0.003	0.001	NA	0.001
M13-07	030-CAP-199	Apr-00	2.5 - 12.5	1,780	40	0.16	0.1 U	0.05 U	0.5 U	0.16	0.0005 U	0.001 U	0.001 U	0.001 U	0.002 UJ	0.003 U
M13-07	385-S13-007	Jun-01	2.5 - 12.5	1,780	40	0.39	NA	0.39 J	NA	NA	0.001 U	0.004 U	0.004 U	0.004 U	0.01 U	NA
M13-07	385-S13-007A	Jun-01	2.5 - 12.5	1,780	40	**4.47**	4.47 J	NA	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA
M13-07	M13-07-A1145	Jun-02	2.5 - 12.5	1,780	40	**2.21**	0.58	0.53	0.3 U	1.1	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 UJ	0.00054 J
M13-07	M13-07-A1646	Dec-02	2.5 - 12.5	1,780	40	**1.78**	0.45	0.52	0.3 U	0.81	0.0005 U	0.0005 U	0.0005 U	0.0002 U	0.0005 U	0.00029 U
M13-08	280-S13-063	Dec-94	22 - 23	2,150	232	ND	0.1 U	0.05 U	0.5 U	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
M13-08	280-S13-065	Feb-95	22 - 23	2,150	232	0.25	0.1 U	0.05 U	0.25 J	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	NA
M13-08	280-S13-066	Jun-95	22 - 23	2,150	232	0.22	0.22 J	0.05 U	0.5 U	NA	0.0005 U	0.0009 J	0.001 U	0.001 U	NA	NA
M13-08	280-S13-067	Aug-95	22 - 23	2,150	232	ND	0.1 U	0.05 U	0.5 U	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	NA
M13-08	385-S13-008	Jun-01	22 - 23	2,150	232	ND	0.1 U	0.05 U	0.1 U	NA	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
M13-08	M13-08-A1146	Jun-02	22 - 23	2,150	232	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0002 U	0.0005 U	0.0005 U	0.00081 J
M13-08	M13-08-A1647	Dec-02	22 - 23	2,150	232	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00017 U
M13-09	280-S13-068	Dec-94	2.5 - 12.5	1,940	140	1.22	1.1 J	0.12 J	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.001 U
M13-09	280-S13-069	Feb-95	2.5 - 12.5	1,940	140	**1.51**	1.4 J	0.11 J	0.2 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.001 U
M13-09	280-S13-070	Jun-95	2.5 - 12.5	1,940	140	1.393	1.3 J	0.09 J	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.0009 J	NA	0.0013 U
M13-09	280-S13-071	Aug-95	2.5 - 12.5	1,940	140	1	1 J	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
M13-09	108-S13-002	Nov-97	2.5 - 12.5	1,940	140	0.8	0.1 J	0.05 U	0.7	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.00078 UJ
M13-09	108-S13-006	Feb-98	2.5 - 12.5	1,940	140	0.58	0.13 J	0.05 U	0.45 J	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.001 UJ
M13-09	108-S13-010	May-98	2.5 - 12.5	1,940	140	0.491	0.1 J	0.03 J	0.36 J	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 UJ
M13-09	108-S13-014	Aug-98	2.5 - 12.5	1,940	140	0.419	0.08 J	0.05 UJ	0.34 J	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 U	NA	0.0017 U
M13-09	385-S13-009	Jun-01	2.5 - 12.5	1,940	140	0.75	0.75	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
M13-09	M13-09-A1147	Jun-02	2.5 - 12.5	1,940	140	**1.52**	0.68	0.05 U	0.84	0.071	0.0005 U	0.0005 U	0.0013	0.0016	0.0005 U	0.00016 U
M13-09	M13-09-A1648	Dec-02	2.5 - 12.5	1,940	140	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00018 U
M-IMF-01	MIMF-01	Aug-91	4 - 13.5	1,500	136	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.002 U
M-IMF-01	M-IMF-01	Apr-92	4 - 13.5	1,500	136	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0015
M-IMF-02	M-IMF-02	Apr-92	3 - 13	1,517	157	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.0922**
MW-1	MW-1 [10/15/90]	Oct-90	3.5 - 13.5	1,350	23	NA	NA	NA	NA	NA	0.4	0.025 U	0.034	0.032	NA	0.05 U
MW-1	280-S13-099	Dec-94	3.5 - 13.5	1,350	23	**10.22**	10 J	0.22 J	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MW-1	280-S13-149	Feb-95	3.5 - 13.5	1,350	23	**7.8**	7.6 J	0.2 J	0.2 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.001 U

TABLE F-4-2: GROUNDWATER ANALYTICAL DATA - SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

						Concentration (mg/L)										
Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
MW-1	280-S13-150	Jun-95	3.5 - 13.5	1,350	23	**6.45**	6.2 J	0.25 J	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MW-1	280-S13-151	Aug-95	3.5 - 13.5	1,350	23	**5.62**	5.4 J	0.22 J	0.5 U	0.1 U	0.0007	0.001 U	0.001 U	0.001 U	NA	0.0017 UJ
MW-1	030-CAP-196	Apr-00	3.5 - 13.5	1,350	23	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	0.002 U	0.003 U
MW-1	385-S13-010	Jun-01	3.5 - 13.5	1,350	23	**4.27**	4.12	0.15	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MW-1	MW-1-A1148	Jun-02	3.5 - 13.5	1,350	23	**2.37**	0.96	0.23	0.64	0.54	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 UJ	0.00052 J
MW-1	MW-1-A1649	Dec-02	3.5 - 13.5	1,350	23	1.304	0.58	0.07	0.45	0.2	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0067
MWOR-1	MWOR-1 [08/24/90]	Aug-90	5 - 15	1,400	3	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA
MWOR-1	280-S13-032	Oct-94	5 - 15	1,400	3	0.75	0.1 U	0.05 U	0.75 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.003 U
MWOR-1	280-S13-033	Feb-95	5 - 15	1,400	3	0.61	0.1 U	0.05 U	0.61 J	0.1 U	0.001 U	0.001 U	0.001 UJ	0.001 U	NA	0.001 U
MWOR-1	280-S13-034	Jun-95	5 - 15	1,400	3	0.69	0.1 U	0.05 U	0.69 J	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MWOR-1	280-S13-035	Aug-95	5 - 15	1,400	3	0.59	0.1 U	0.05 U	0.59 J	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MWOR-1	385-S13-001	Jun-01	5 - 15	1,400	3	0.49	0.1 U	0.05 U	0.49	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MWOR-2	MWOR-2 [08/27/90]	Aug-90	5 - 15	1,130	30	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA
MWOR-2	280-S13-037	Oct-94	5 - 15	1,130	30	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MWOR-2	280-S13-038	Feb-95	5 - 15	1,130	30	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.001 U
MWOR-2	280-S13-039	Jun-95	5 - 15	1,130	30	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MWOR-2	280-S13-040	Aug-95	5 - 15	1,130	30	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0022 U
MWOR-2	385-S13-002	Jun-01	5 - 15	1,130	30	ND	NA	0.05 U	NA	NA	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MWOR-2	385-S13-002A	Jul-01	5 - 15	1,130	30	ND	0.1 U	NA	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA
MWOR-3	MWOR-3 [08/27/90]	Aug-90	5 - 15	1,750	28	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA
MWOR-3	280-S13-041	Oct-94	5 - 15	1,750	28	0.58	0.1 U	0.05 U	0.58 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MWOR-3	280-S13-042	Feb-95	5 - 15	1,750	28	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 UJ	0.001 U	0.001 U	0.001 U	NA	0.0084 UJ
MWOR-3	280-S13-043	Jun-95	5 - 15	1,750	28	0.52	0.1 U	0.05 U	0.52 J	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MWOR-3	280-S13-045	Aug-95	5 - 15	1,750	28	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MWOR-3	385-S13-003	Jun-01	5 - 15	1,750	28	0.47	0.1 U	0.05 U	0.47	0.1 U	0.0005 UJ	0.002 UJ	0.002 UJ	0.002 U	0.005 UJ	NA
MWOR-4	MWOR-4 [08/28/90]	Aug-90	5 - 15	1,750	203	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	0.05 U
MWOR-4	280-S13-046	Oct-94	5 - 15	1,750	203	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MWOR-4	280-S13-047	Feb-95	5 - 15	1,750	203	ND	0.1 U	0.05 U	0.2 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.001 U
MWOR-4	280-S13-048	Jun-95	5 - 15	1,750	203	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MWOR-4	280-S13-049	Aug-95	5 - 15	1,750	203	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0022 UJ
MWOR-4	385-S13-004	Jun-01	5 - 15	1,750	203	ND	0.1 U	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MWOR-4	MWOR-4-A1159	Jun-02	5 - 15	1,750	203	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.000045 U
MWOR-4	MWOR-4-A1660	Dec-02	5 - 15	1,750	203	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00023 U
S13-DGS-VE01	385-S13-014	Aug-01	5.5 - 8	1,380	6	1.3	0.2 U	0.05 U	1.3	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S13-DGS-VE02	385-S13-017	Aug-01	8.5 - 10	1,700	8	ND	0.2 U	0.05 U	0.2 U	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
S13-DGS-VE02	385-S13-017A	Aug-01	8.5 - 10	1,700	8	**1.9**	0.1 U	0.05 U	1.9	0.1 U	0.0005 U	0.002 U	0.002 U	0.0003 J	0.005 U	NA
S13-DGS-VE03	385-S13-027	Apr-00	7	1,700	15	**3.95**	0.1	0.06 UJ	3.85	0.098 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA

Notes:

Bold	Indicates preliminary remediation criteria presented in Table F-2-1 or free product criteria is exceeded.
J	Indicates an estimated concentration value
U	Indicates compound was analyzed for but not detected above the concentration listed
UJ	Indicates compound was analyzed for but not detected above the estimated concentration listed
mg/L	Milligrams per liter
MTBE	Methyl tertiary butyl ether
NA	Not analyzed
	Not detected at the total petroleum hydrocarbon detection limits
TPH-d	Total petroleum hydrocarbons as diesel
TPH-g	Total petroleum hydrocarbons as gasoline
TPH-mo	Total petroleum hydrocarbons as motor oil
TTPH	Total total petroleum hydrocarbons (sum of all TPH factions)

TABLE F-4-3: LOW-RISK FUEL SITE CLOSURE ASSESSMENT CERCLA SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

RWQCB LOW-RISK FUEL SITE CLOSURE CRITERIA	CRITERIA MET	EXPLANATION
The leak and source(s) have been removed	False	Since April 1997, Alameda Point ceased all naval operations, thereby eliminating possible sources of contamination associated with aircraft maintenance and operation activities. In addition, all aboveground storage tanks were demolished prior to 1990 and all fuel lines were removed in 1998. However, floating product is present at the southern portion of CERCLA Site 13 within the mini-storage area.
The site has been adequately characterized	True	Multiple investigations that assessed possible TPH contamination were conducted at Site 13 (see Tables F-4-1 and F-4-2). Soil and groundwater have been characterized for the purpose of this evaluation.
Little or no groundwater impact currently exists, and no contaminants are found at levels above applicable water quality objectives	False	TTPH and TPH-associated constituents exceeded PRC for potential exposure to marine ecological receptors through the storm drain exposure pathway. Benzene and lead exceeded PRC for potential exposure to marine ecological receptors through the storm drain exposure pathway. Groundwater is impacted above applicable water quality criteria to marine ecological receptors.
No water wells, deeper drinking water aquifers, surface water, or other sensitive receptors are likely to be impacted	False	Although no drinking water wells are located within Site 13, and groundwater at Site 13 does not discharge to surface water, groundwater at Site 13 is designated as part of the southeastern region, and is considered a potential drinking water source. TPH-associated constituents (benzene and lead) exceeded PRC for groundwater as a potential drinking water source.
The site presents no significant risk to human health	False	Potential reuse for Site 13 includes residential homes mixed with offices, retail, service commercial, research and development, or light industrial areas. TPH-associated constituents in soil exceeded PRC for residential reuse and volatilization of constituents to indoor air; therefore, the site presents a significant risk to human health.
The site presents no significant risk to the environment	False	Based on exposure pathways evaluated for marine ecological receptors, TTPH and TPH-associated constituents in groundwater samples exceed the criteria through the storm drain exposure pathway.
The dissolved groundwater plume is not migrating	Unknown	Two plumes exist at Site 13. The western plume (Plume 1) contains TPH contamination; the eastern plume (Plume 2) contains elevated concentrations of TPH, benzene, and lead. Groundwater at Site 13 generally flows is to the west. The western plume is currently undergoing remediation; however, there is not adequate information on the western end of that plume to determine whether it is migrating westward. It is not clear whether the TPH, benzene, and lead concentrations in monitoring wells (M13-07 and MW530-1 in Site 23) to the west of eastern plume show whether the plume is migrating because the concentrations remain above the PRC.

TABLE F-4-3: LOW-RISK FUEL SITE CLOSURE ASSESSMENT CERCLA SITE 13

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Notes:

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
OU	Operable Unit
PRC	Preliminary remediation criteria
RWQCB	Regional water quality control board
TPH	Total petroleum hydrocarbons
TPH-associated constituents	TPH-diesel range, -gasoline range, -jet fuel range, and -motor oil range; benzene; toluene; ethylbenzene; xylenes; methyl tertiary butyl ether; and lead
TTPH	Total TPH

TABLE F-5-1: SOIL ANALYTICAL DATA - SITE 19

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

				Concentration (mg/kg)										
Point Name	Sample Identification	Sample Date	Sample Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
030-S19-005	030-S19-005	Oct-98	0 - 3	ND	11 U	0.54 UJ	11 U	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	3.1 J
030-S19-007	030-S19-007	Oct-98	0 - 2.5	0.05	11 U	0.05 J	11 U	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	4.8 J
134-006-041	134-0071	Oct-95	3 - 4	ND	24 U	0.52 UJ	24 U	NA	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
134-006-041	134-0072	Oct-95	5.5 - 6.5	1.4	28 U	1.4 YJ	28 U	NA	0.012 U	0.012 U	0.012 U	0.012 U	NA	NA
134-IW-005	134I-005	Jan-95	7 - 7.5	ND	12 U	0.6 U	24 U	NA	0.012 U	0.012 U	0.012 U	0.012 U	NA	15.1 EJ
134-IW-005	134I-005M	Jan-95	7 - 7.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.01 U	0.03	NA	25 U
134-SN-003	134S-003M	Jan-95	3 - 3.5	ND	50 U	50 U	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
134-SS-003	134M-003M	Feb-95	7.5 - 8	ND	50 U	50 U	NA	NA	0.01 U	0.01 U	0.01 U	0.03	NA	25 U
134-Z22-025	134-0025M	Apr-95	2.5 - 3	84	2.2 U	0.54 U	84	NA	NA	NA	NA	NA	NA	6.5
210-IW-004	210I-004	Feb-95	4 - 4.5	ND	12 U	0.61 U	24 U	NA	0.012 U	0.012 U	0.012 U	0.012 U	NA	2.4
210-IW-004	210I-004M	Feb-95	4 - 4.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.01 U	0.03	NA	25 U
372-1-MOJ	372-P1	Sep-97	6	ND	1 U	1 U	10 U	NA	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	NA
372-2-MOJ	372-P2	Sep-97	5.5	ND	1 U	1 U	10 U	NA	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	NA
372-MW2	372-MW2	Jan-95	3.5	17	17	1 U	NA	NA	12 U	12 U	12 U	12 U	NA	NA
B19-17	280-S19-001	Aug-94	1 - 2	4,683.3	54 U	3.3 J	**4,680 J**	54 U	NA	NA	NA	NA	NA	NA
B19-17	280-S19-002	Aug-94	2.5 - 3.5	ND	11 U	0.56 U	28 U	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
B19-17	280-S19-003	Aug-94	5 - 6	ND	12 U	0.6 U	30 U	12 U	0.012 U	0.012 U	0.012 U	0.012 U	NA	NA
B19-18	280-S19-004	Aug-94	1 - 2	ND	11 U	0.53 U	26 U	11 U	NA	NA	NA	NA	NA	NA
B19-18	280-S19-005	Aug-94	2 - 3	97	13 U	0.53 U	97 J	13 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
B19-18	280-S19-004	Aug-94	1 - 2	ND	11 U	0.53 U	26 U	11 U	NA	NA	NA	NA	NA	NA
B19-18	280-S19-005	Aug-94	2 - 3	97	13 U	0.53 U	97 J	13 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
B19-19	280-S19-008	Aug-94	1 - 2	330	57 U	0.57 U	330 J	57 U	NA	NA	NA	NA	NA	NA
B19-19	280-S19-009	Aug-94	2.5 - 3.5	ND	12 U	0.59 U	29 U	12 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
B19-19	280-S19-010	Aug-94	5 - 6	ND	12 U	0.6 U	30 U	12 U	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
BD13-5	BD13-5 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BD13-5	BD13-5 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.0054 U	0.022	0.0054 U	0.021	NA	NA
BD13-5	BD13-5 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.6
BD13-5	BD13-5 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	0.006 U	0.074	0.006 U	0.006 U	NA	NA
BD13-5	BD13-5 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BD13-5	BD13-5 [9.5-10.0]	Jul-90	9.5 - 10	NA	NA	NA	NA	NA	0.0059 U	0.056	0.008	0.051	NA	NA
BD13-5	BD13-5 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U
BD13-5	BD13-5 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.0059 U	0.011	0.0059 U	0.0059 U	NA	NA
BD13-5	BD13-5 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BD13-5	BD13-5 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.0059 U	0.013	0.0059 U	0.0059 U	NA	NA
BD13-6	BD13-6 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BD13-6	BD13-6 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.0052 U	0.01	0.0052 U	0.0052 U	NA	NA
BD13-6	BD13-6 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.6 U
BD13-6	BD13-6 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	0.0059 U	0.1	0.0059 U	0.0059 U	NA	NA
BD13-6	BD13-6 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U

TABLE F-5-1: SOIL ANALYTICAL DATA - SITE 19

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

				Concentration (mg/kg)										
Point Name	Sample Identification	Sample Date	Sample Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
BD13-6	BD13-6 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	0.006 U	0.035	0.006 U	0.006 U	NA	NA
BD13-6	BD13-6 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BD13-6	BD13-6 [9.5-10.0]	Jul-90	9.5 - 10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BD13-6	BD13-6 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.006 U	0.027	0.006 U	0.013	NA	NA
BD13-6	BD13-6 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.0059 U	0.036	0.006	0.045	NA	NA
BD13-7	BD13-7 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BD13-7	BD13-7 [1.5-2.0]	Jul-90	1.5 - 2	NA	NA	NA	NA	NA	0.0062 U	0.058	0.0062 U	0.0062 U	NA	NA
BD13-7	BD13-7 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13
BD13-7	BD13-7 [4.5-5.0]	Jul-90	4.5 - 5	NA	NA	NA	NA	NA	0.011 U	0.28	0.011 U	0.011 U	NA	NA
BD13-7	BD13-7 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
BD13-7	BD13-7 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	0.0058 U	0.01	0.0058 U	0.0058 U	NA	NA
BD13-7	BD13-7 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BD13-7	BD13-7 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.0058 U	0.049	0.0058 U	0.0058 U	NA	NA
BD13-7	BD13-7 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BD13-7	BD13-7 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.017	0.006 U	0.006 U	NA	NA
BD13-8	BD13-8 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BD13-8	BD13-8 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.039	0.005 U	0.005 U	NA	NA
BD13-8	BD13-8 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.4 U
BD13-8	BD13-8 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	0.006 U	0.005 J	0.006 U	0.006 U	NA	NA
BD13-8	BD13-8 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BD13-8	BD13-8 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	0.006 U	0.022	0.006 U	0.006 U	NA	NA
BD13-8	BD13-8 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
BD13-8	BD13-8 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	0.006 U	0.019	0.006 U	0.006 U	NA	NA
BD13-8	BD13-8 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.9
BD13-8	BD13-8 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	0.006 U	0.028	0.006 U	0.006 U	NA	NA
BD13-9	BD13-9 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BD13-9	BD13-9 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.005 U	0.048	0.005 U	0.005 U	NA	NA
BD13-9	BD13-9 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.9
BD13-9	BD13-9 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	0.006 U	0.02	0.006 U	0.006 U	NA	NA
BD13-9	BD13-9 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27
BD13-9	BD13-9 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.006 U	0.031	0.006 U	0.006 U	NA	NA
BD13-9	BD13-9 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BD13-9	BD13-9 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.006 U	0.021	0.006 U	0.006 U	NA	NA
BD13-9	BD13-9 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.005 J	0.006 U	0.006 U	NA	NA
BD13-9	BD13-9 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BD13-10	BD13-10 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BD13-10	BD13-10 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.008 U	0.005 J	0.008 U	0.003 J	NA	NA
BD13-10	BD13-10 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	44
BD13-10	BD13-10 [4.5-5.0]	Jul-90	4.5 - 5	NA	NA	NA	NA	NA	0.006 U	0.024	0.006 U	0.006 U	NA	NA

TABLE F-5-1: SOIL ANALYTICAL DATA - SITE 19

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Concentration (mg/kg)										
				TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
BD13-10	BD13-10 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BD13-10	BD13-10 [7.5-8.0]	Jul-90	7.5 - 8	NA	NA	NA	NA	NA	0.006 U	0.011	0.006 U	0.006 U	NA	NA
BD13-10	BD13-10 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10
BD13-10	BD13-10 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	0.006 U	0.046	0.006 U	0.006 U	NA	NA
BD13-10	BD13-10 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BD13-10	BD13-10 [13.5-14.0]	Jul-90	13.5 - 14	NA	NA	NA	NA	NA	0.006 U	0.02	0.006 U	0.006 U	NA	NA
BD13-10	BD13-10 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BD13-11	BD13-11 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BD13-11	BD13-11 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.008	0.005 U	0.005 U	NA	NA
BD13-11	BD13-11 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BD13-11	BD13-11 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.7 U
BD13-11	BD13-11 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	0.006 U	0.15	0.006 U	0.006 U	NA	NA
BD13-11	BD13-11 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	0.006 U	0.055	0.006 U	0.006 U	NA	NA
BD13-11	BD13-11 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
BD13-11	BD13-11 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	0.006 U	0.021	0.006 U	0.006 U	NA	NA
BD13-11	BD13-11 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BD13-11	BD13-11 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	0.006 U	0.014	0.006 U	0.006 U	NA	NA
BD13-12	BD13-12 [1.5-2.0]	Jul-90	1.5 - 2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BD13-12	BD13-12 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.0052 U	0.011	0.0052 U	0.0052 U	NA	NA
BD13-12	BD13-12 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BD13-12	BD13-12 [4.5-5.0]	Jul-90	4.5 - 5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U
BD13-12	BD13-12 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	0.0061 U	0.076	0.0061 U	0.0061 U	NA	NA
BD13-12	BD13-12 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.0065 U	0.029	0.0065 U	0.0065 U	NA	NA
BD13-12	BD13-12 [9.5-10.0]	Jul-90	9.5 - 10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.8
BD13-12	BD13-12 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	0.006 U	0.14	0.006 U	0.006 U	NA	NA
BD13-12	BD13-12 [12.0-12.5]	Jul-90	12 - 12.5	NA	NA	NA	NA	NA	0.006 U	0.041	0.006 U	0.006 U	NA	NA
BD13-12	BD13-12 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BD13-12	BD13-12 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	0.0059 U	0.1	0.0059 U	0.0059 U	NA	NA
BD13-13	BD13-13 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**303**
BD13-13	BD13-13 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.011	0.006 U	0.006 U	NA	NA
BD13-13	BD13-13 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 U
BD13-13	BD13-13 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.006 U	0.02	0.006 U	0.006 U	NA	NA
BD13-13	BD13-13 [9.5-10.0]	Jul-90	9.5 - 10	NA	NA	NA	NA	NA	0.006 U	0.01	0.006 U	0.006 U	NA	NA
BD13-13	BD13-13 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U
BD13-13	BD13-13 [12.0-12.5]	Jul-90	12 - 12.5	NA	NA	NA	NA	NA	0.006 U	0.013	0.006 U	0.006 U	NA	NA
BD13-13	BD13-13 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 U
BD13-13	BD13-13 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	0.006 U	0.021	0.006 U	0.006 U	NA	NA
BD13-14	BD13-14 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BD13-14	BD13-14 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	0.0052 U	0.014	0.0052 U	0.0052 U	NA	NA

TABLE F-5-1: SOIL ANALYTICAL DATA - SITE 19

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Concentration (mg/kg)										
				TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
BD13-14	BD13-14 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BD13-14	BD13-14 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BD13-14	BD13-14 [9.5-10.0]	Jul-90	9.5 - 10	NA	NA	NA	NA	NA	0.0065 U	0.1	0.0065 U	0.0065 U	NA	NA
BD13-14	BD13-14 [13.5-14.0]	Jul-90	13.5 - 14	NA	NA	NA	NA	NA	0.0059 U	0.025	0.0059 U	0.0059 U	NA	NA
BD13-14	BD13-14 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BD13-14	BD13-14 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	0.0062 U	0.028	0.0062 U	0.0062 U	NA	NA
BD13-14	BD13-14 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BD13-14	BD13-14 [15.5-16.0]	Jul-90	15.5 - 16	NA	NA	NA	NA	NA	0.006 U	0.034	0.006 U	0.006 U	NA	NA
BD13-15	BD13-15 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13.7
BD13-15	BD13-15 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	0.006 U	0.16	0.006 U	0.006 U	NA	NA
BD13-15	BD13-15 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BD13-15	BD13-15 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	0.006 U	0.023	0.006 U	0.006 U	NA	NA
BD13-15	BD13-15 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.006 U	0.024	0.006 U	0.006 U	NA	NA
BD13-15	BD13-15 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
BD13-15	BD13-15 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	0.006 U	0.016	0.006 U	0.006 U	NA	NA
BD13-15	BD13-15 [13.5-14.0]	Jul-90	13.5 - 14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
BD13-15	BD13-15 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	0.006 U	0.022	0.006 U	0.006 U	NA	NA
BD13-16	BD13-16 [1.5-2.0]	Jul-90	1.5 - 2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BD13-16	BD13-16 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	0.005 U	0.002 J	0.005 U	0.005 U	NA	NA
BD13-16	BD13-16 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BD13-16	BD13-16 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	0.006 U	0.004 J	0.006 U	0.006 U	NA	NA
BD13-16	BD13-16 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	0.006 U	0.036	0.006 U	0.006 U	NA	NA
BD13-16	BD13-16 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	385
BD13-16	BD13-16 [12.0-12.5]	Jul-90	12 - 12.5	NA	NA	NA	NA	NA	0.006 U	0.008	0.006 U	0.006 U	NA	NA
BD13-16	BD13-16 [13.5-14.0]	Jul-90	13.5 - 14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2
BD13-16	BD13-16 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.012	0.006 U	0.006 U	NA	NA
M19-05	280-S19-011	Nov-94	0.5 - 1.5	ND	11 U	0.53 U	21 U	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
M19-05	280-S19-012	Nov-94	2.5 - 3.5	36	11 U	0.56 U	36 J	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
M19-05	280-S19-013	Nov-94	4.5 - 5.5	ND	10 U	0.52 U	21 U	10 U	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
MWD13-1	MWD13-1 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 U
MWD13-1	MWD13-1 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	0.006 U	0.034	0.006 U	0.006 U	NA	NA
MWD13-1	MWD13-1 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 U
MWD13-1	MWD13-1 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.006 U	0.017	0.006 U	0.006 U	NA	NA
MWD13-1	MWD13-1 [9.5-10.0]	Jul-90	9.5 - 10	NA	NA	NA	NA	NA	0.006 U	0.036	0.006 U	0.006 U	NA	NA
MWD13-1	MWD13-1 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 U
MWD13-1	MWD13-1 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	0.006 U	0.03	0.006 U	0.006 U	NA	NA
MWD13-1	MWD13-1 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.1 U
MWD13-1	MWD13-1 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.018	0.006 U	0.006 U	NA	NA
MWD13-2	MWD13-2 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	28.4

TABLE F-5-1: SOIL ANALYTICAL DATA - SITE 19

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

				Concentration (mg/kg)										
Point Name	Sample Identification	Sample Date	Sample Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
MWD13-2	MWD13-2 [1.5-2.0]	Jul-90	1.5 - 2	NA	NA	NA	NA	NA	0.68 U	1 D	0.68 U	0.19 J	NA	NA
MWD13-2	MWD13-2 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.6
MWD13-2	MWD13-2 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	NA	0.004	0.006 U	0.006 U	NA	NA
MWD13-2	MWD13-2 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	NA	0.037	0.006 U	0.006 U	NA	NA
MWD13-2	MWD13-2 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40.5
MWD13-2	MWD13-2 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	NA	0.025	0.006 U	0.006 U	NA	NA
MWD13-2	MWD13-2 [13.5-14.0]	Jul-90	13.5 - 14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
MWD13-2	MWD13-2 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	0.006 U	0.005 J	0.006 U	0.006 U	NA	NA
MWD13-3	MWD13-3 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
MWD13-3	MWD13-3 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	0.054	0.006 U	0.006 U	NA	NA
MWD13-3	MWD13-3 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	0.006 U	0.045	0.006 U	0.006 U	NA	NA
MWD13-3	MWD13-3 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
MWD13-3	MWD13-3 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.007 U	0.016	0.007 U	0.007 U	NA	NA
MWD13-3	MWD13-3 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA

Notes:

Bold	Indicates preliminary remediation criteria presented in Table F-2-1 or free product criteria is exceeded.
D	Resembles a diesel fuel pattern
J	Indicates an estimated concentration value
mg/kg	Milligrams per kilogram
MTBE	Methyl tertiary butyl ether
NA	Not analyzed
ND	Not detected at the total petroleum hydrocarbon detection limits
TPH	Total petroleum hydrocarbon
TPH-d	Total petroleum hydrocarbons as diesel
TPH-g	Total petroleum hydrocarbons as gasoline
TPH-mo	Total petroleum hydrocarbons as motor oil
TTPH	Total total petroleum hydrocarbons (sum of all TPH fractions)
U	Indicates compound was analyzed for but not detected above the concentration listed
UJ	Indicates compound was analyzed for but not detected above the estimated concentration listed

TABLE F-5-2: GROUNDWATER ANALYTICAL DATA - SITE 19

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	Concentration (mg/L)										
						TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
134-006-041	134-0070	Oct-95	8 - 9	997	35	ND	0.1 U	0.05 U	0.2 U	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	NA
372-1-MOJ	372-P1	Sep-97	-	1,023	3.5	0.67	0.67	0.05 U	NA	0.5 U	0.0005 U	0.0005 U	0.0005 U	0.001 U	0.005 U	NA
372-2-MOJ	372-P2	Sep-97	-	988	36	0.54	0.54	0.05 U	NA	0.5 U	0.0005 U	0.0005 U	0.0005 U	0.001 U	0.005 U	NA
372-MW2	372-MW2	Feb-95	2.6	1,037	17.2	0.15	0.15	0.05 U	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
372-MW2	372-MW2	Dec-97	2.6	1,037	17.2	0.064	0.064	0.05 U	0.25 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
372-MW2	372-MW2	Mar-98	2.6	1,037	17.2	0.19	0.11	0.05 U	0.25 U	0.08	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
372-MW2	372-MW2	Sep-98	2.6	1,037	17.2	0.067	0.067	0.05 U	0.25 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
372-MW2	372-MW2	Apr-99	2.6	1,037	17.2	0.06	0.06	0.05 U	0.25 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
D19-01	280-S19-060	Dec-94	50 - 60	1,056	32.5	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.01 U
D19-01	280-S19-061	Mar-95	50 - 60	1,056	32.5	NA	NA	NA	NA	NA	0.001 UJ	0.001 U	0.001 U	0.001 U	NA	0.005 U
D19-01	280-S19-062	Jun-95	50 - 60	1,056	32.5	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0039 U
D19-01	280-S19-063	Sep-95	50 - 60	1,056	32.5	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0055 U
D19-01	108-S04-045	May-98	50 - 60	1,056	32.5	0.32	0.12 U	0.05 U	0.32 J	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0018 UJ
D19-01	108-S19-004	Aug-98	50 - 60	1,056	32.5	0.18	0.12 UJ	0.034 UJ	0.18 J	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	0.0017 U
D19-01	385-S19-006	Jul-01	50 - 60	1,056	32.5	ND	0.1 U	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
D19-01	D19-01-A1085	Jul-02	50 - 60	1,056	32.5	ND	0.05 UJ	0.05 U	0.3 UJ	0.05 UJ	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.000035 U
D19-01	D19-01-A1586	Dec-02	50 - 60	1,056	32.5	0.024	0.05 U	0.024	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00046 U
DHP-S19-01	280-S19-038	Aug-94	19	1,162	112.5	0.46	0.1 U	0.05 U	0.46 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S19-02	280-S19-039	Aug-94	22	1,054	29.5	0.54	0.1 U	0.05 U	0.54 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S19-03	280-S19-041	Sep-94	20.5	1,063	40.2	0.72	0.1 U	0.05 U	0.72 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S19-04	280-S19-042	Aug-94	21.3	1,176	40.3	0.58	0.1 U	0.05 U	0.58 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S19-05	280-S19-043	Aug-94	10 - 13	1,009	13.5	1.17	0.1 U	0.05 U	1.17 J	0.1 U	NA	NA	NA	NA	NA	NA
M19-05	280-S19-033	Dec-94	20 - 30	1,252	88.5	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.005	0.001 U	0.002	NA	0.0015 U
M19-05	280-S19-035	Mar-95	20 - 30	1,252	88.5	0.27	0.1 U	0.05 U	0.27 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.005 U
M19-05	280-S19-036	Jun-95	20 - 30	1,252	88.5	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0053
M19-05	280-S19-037	Aug-95	20 - 30	1,252	88.5	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
M19-05	385-S19-005	Jul-01	20 - 30	1,252	88.5	ND	0.1 U	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MWD13-1	MWD13-1 [08/09/90]	Oct-90	5 - 15	1,157	118	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	**0.058**
MWD13-1	280-S19-016	Oct-94	5 - 15	1,157	118	0.46	0.1 U	0.05 U	0.46 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MWD13-1	280-S19-017	Mar-95	5 - 15	1,157	118	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.001 U
MWD13-1	280-S19-018	Jun-95	5 - 15	1,157	118	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MWD13-1	280-S19-019	Aug-95	5 - 15	1,157	118	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MWD13-1	385-S19-001	Jul-01	5 - 15	1,157	118	0.37	0.1 U	0.03 J	0.34	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MWD13-2	MWD13-2 [08/09/90]	Aug-90	5 - 15	1,054	30.5	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	0.05 U
MWD13-2	280-S19-021	Oct-94	5 - 15	1,054	30.5	0.54	0.1 U	0.05 U	0.54 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MWD13-2	280-S19-022	Mar-95	5 - 15	1,054	30.5	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 UJ	0.001 U	0.001 U	0.001 U	NA	0.001 U
MWD13-2	280-S19-023	Jun-95	5 - 15	1,054	30.5	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MWD13-2	280-S19-024	Aug-95	5 - 15	1,054	30.5	0.27	0.27 J	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MWD13-2	108-S04-046	May-98	5 - 15	1,054	30.5	1	0 U	0.05 U	1 J	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 UJ
MWD13-2	108-S19-005	Aug-98	5 - 15	1,054	30.5	0.788	0.19 J	0.028 J	0.57 J	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	0.0017 U
MWD13-2	385-S19-002	Jul-01	5 - 15	1,054	30.5	ND	0.1 U	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MWD13-3	MWD13-3 [08/10/90]	Oct-90	5 - 15	1,080	50	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	**0.21**
MWD13-3	280-S19-025	Oct-94	5 - 15	1,080	50	0.39	0.1 U	0.05 U	0.39 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0029 J
MWD13-3	280-S19-026	Mar-95	5 - 15	1,080	50	0.11	0.1 U	0.11 J	0.5 U	0 U	0.001 UJ	0.001 U	0.001 U	0.001 U	NA	0.001 U
MWD13-3	280-S19-027	Jun-95	5 - 15	1,080	50	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MWD13-3	280-S19-028	Aug-95	5 - 15	1,080	50	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MWD13-3	108-S19-001	Nov-97	5 - 15	1,080	50	ND	0.1 UJ	0.05 U	0.3 U	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.00065 U
MWD13-3	108-S19-002	Feb-98	5 - 15	1,080	50	ND	0.12 UJ	0.05 U	0.24 UJ	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0007 UJ
MWD13-3	108-S19-003	May-98	5 - 15	1,080	50	0.046	0.12 UJ	0.046 J	0.24 UJ	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0069 UJ

TABLE F-5-2: GROUNDWATER ANALYTICAL DATA - SITE 19

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	Concentration (mg/L) TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
MWD13-3	108-S19-006	Aug-98	5 - 15	1,080	50	0.14	0.12 U	0.05 U	0.14 J	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0017 U
MWD13-3	385-S19-003	Jul-01	5 - 15	1,080	50	0.03	0.1 U	0.03 J	0.1 U	0.1 U	0.0005 UJ	0.002 UJ	0.002 UJ	0.002 UJ	0.005 UJ	NA
MWD13-3	MWD13-3-A1157	Jun-02	5 - 15	1,080	50	0.128	0.055	0.05 U	0.073 J	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00032 U
MWD13-3	MWD13-3-A1658	Dec-02	5 - 15	1,080	50	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0003	0.0002
MWD13-4	MWD13-4 [08/10/90]	Oct-90	5 - 15	1,157	65	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	**0.56**
MWD13-4	280-S19-029	Oct-94	5 - 15	1,157	65	0.38	0.1 U	0.05 U	0.38 J	0.1 U	**0.002**	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MWD13-4	280-S19-030	Mar-95	5 - 15	1,157	65	ND	0.1 U	0.05 U	0.5 U	0.1 U	**0.001 J**	0.001 U	0.001 U	0.001 U	NA	0.001 U
MWD13-4	280-S19-031	Jun-95	5 - 15	1,157	65	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0009	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MWD13-4	280-S19-032	Aug-95	5 - 15	1,157	65	ND	0.1 UJ	0.05 U	0.5 UJ	0.1 UJ	**0.001**	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MWD13-4	385-S19-004	Jul-01	5 - 15	1,157	65	0.09	0.06 J	0.03 J	0.1 U	0.1 U	0.0003 J	0.002 U	0.002 U	0.002 U	0.005 U	NA
MWD13-4	MWD13-4-A1158	Jun-02	5 - 15	1,157	65	0.36	0.15	0.019 U	0.21 J	0.05 U	0.0003 U	0.0004 J	0.0005 U	0.0005 U	0.0005 U	0.00012 U
MWD13-4	MWD13-4-A1349	Sep-02	5 - 15	1,157	65	0.034	0.05 U	0.034 J	0.3 U	0.05 U	0.0002 J	0.0005 U	0.0001 J	0.0005 J	0.0002 U	0
MWD13-4	MWD13-4-A1659	Dec-02	5 - 15	1,157	65	0.018	0.05 U	0.018	0.3 U	0.05 UJ	0.0003	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00049 U
MWD13-4	MWD13-4-A2001	Apr-03	5 - 15	1,157	65	ND	0.05 U	0.027 U	0.3 U	0.05 U	0.0002 J	0.0005 U	0.0005 U	0.0005 U	0.0005 U	NA
SHP-S19-01	280-S19-057	Sep-94	10 - 13	1,207	81.7	3.311	0.1 U	0.071 J	3.24 J	0.1 U	NA	NA	NA	NA	NA	NA
SHP-S19-02	280-S19-058	Aug-94	6.5 - 10	1,253	77.3	0.22	0.1 UJ	0.05 U	0.22 J	0.1 UJ	NA	NA	NA	NA	NA	NA
SHP-S19-03	280-S19-059	Aug-94	6.5 - 10	1,258	89	0.664	0.1 U	0.064 J	0.6 J	0.1 U	NA	NA	NA	NA	NA	NA

Notes:

Bold	Indicates preliminary remediation criteria presented in Table F-2-1 or free product criteria is exceeded.
J	Indicates an estimated concentration value
mg/L	Milligrams per liter
MTBE	Methyl tertiary butyl ether
NA	Not analyzed
ND	Not detected at total petroleum hydrocarbon detection limits.
TPH	Total petroleum hydrocarbon
TPH-d	Total petroleum hydrocarbons as diesel
TPH-g	Total petroleum hydrocarbons as gasoline
TPH-mo	Total petroleum hydrocarbons as motor oil
TTPH	Total total petroleum hydrocarbons (sum of all TPH fractions)
U	Indicates compound was analyzed for but not detected above the concentration listed
UJ	Indicates compound was analyzed for but not detected above the estimated concentration listed

TABLE F-5-3: LOW-RISK FUEL SITE CLOSURE ASSESSMENT CERCLA SITE 19

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

RWQCB LOW-RISK FUEL SITE CLOSURE CRITERIA	CRITERIA MET	EXPLANATION
The leak and source(s) have been removed	True	Since April 1997, Alameda Point ceased all naval operations, thereby eliminating possible sources of contamination associated with aircraft maintenance and operation activities. In addition, all underground storage tanks were closed in place in 1987, and all fuel lines were closed in place in 1998. Floating product (a possible groundwater source) is not present at CERCLA Site 19.
The site has been adequately characterized	True	Multiple investigations that assessed possible TPH contamination were conducted at Site 19 (see Tables F-5-1 and F-5-2). Soil and groundwater have been adequately characterized, and no data gaps were identified during this evaluation.
Little or no groundwater impact currently exists, and no contaminants are found at levels above applicable water quality objectives	True	At Site 19, TPH-associated constituents (lead) exceeded PRC for potential exposure to marine ecological receptors through the storm drain exposure pathway. The samples are greater than 50 feet from the nearest storm drain, and recent data did not indicate detections exceeding PRC. Corrective action is not warranted for potential exposure to marine ecological receptors through the storm drain exposure pathway.
No water wells, deeper drinking water aquifers, surface water, or other sensitive receptors are likely to be impacted	True	Although no drinking water wells are located within Site 19, and the site is greater than 250 feet from the shoreline; groundwater at Site 19 is designated as part of the southeastern region and is considered a potential drinking water source. TPH-associated constituent concentrations (lead and benzene) exceeded PRC for groundwater as a potential drinking water source in the past; however, subsequent samples collected from the same locations are non-detect for lead and benzene. Corrective action is not warranted for groundwater as a potential drinking water source.
The site presents no significant risk to human health	True	Potential reuse for Site 19 includes residential homes mixed with offices, retail, service commercial, research and development, or light industrial areas. TPH-associated constituents in soil were screened against PRC for residential reuse, and TPH-associated constituents were screened against residential PRC for volatilization of constituents to indoor air. TPH-associated constituents in groundwater did not exceed the PRC for volatilization for constituents to indoor air. TPH-associated and TPH-fraction concentrations in soil exceeded the PRC for residential reuse in two isolated surface soils only.

TABLE F-5-3: LOW-RISK FUEL SITE CLOSURE ASSESSMENT CERCLA SITE 19

RWQCB LOW-RISK FUEL SITE CLOSURE CRITERIA	CRITERIA MET	EXPLANATION
The site presents no significant risk to the environment	True	Based on exposure pathways evaluated for marine ecological receptors, TPH-associated constituent concentrations in groundwater samples collected from Site 19 indicate that there is no significant risk to the environment.
The dissolved groundwater plume is not migrating	True	Based on the recent data collected to assess possible TPH contamination, a TPH groundwater plume with concentrations greater than applicable PRC is not present at Site 19.

Notes:

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
OU	Operable Unit
PRC	Preliminary remediation criteria
RWQCB	Regional Water Quality Control Board
TPH	Total petroleum hydrocarbon
TPH-associated constituents	TPH-diesel range, -gasoline range, -jet fuel range, and -motor oil range; benzene; toluene; ethylbenzene; xylenes; methyl tertiary butyl ether; and lead
TTPH	Total TPH

TABLE F-o-1: SOIL ANALYTICAL DATA - SITE 23

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
148-001-004	148-0005M	Feb-95	3.5 - 4	ND	50 U	50 U	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
148-001-007	148-0008M	Feb-95	4 - 4.5	ND	50 U	50 U	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
148-001-001	148-0002M	Feb-95	3.5 - 4	ND	50 U	50 U	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
148-001-001	148-0003	Feb-95	3.5 - 4	450	11 UJ	0.53 UJ	450 YJ	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	1.3
150-Z19-016	150-0016M	Jun-95	0.5 - 1	1,103	3	0.5 U	1,100	NA	NA	NA	NA	NA	NA	1.7
153-Z22-004	153-0004	Apr-95	2.5 - 3	100	11 U	0.5 U	100 YJ	NA	NA	NA	NA	NA	NA	4.4
153-Z22-004	153-0004M	Apr-95	2.5 - 3	36	1.1 U	0.57 U	36	NA	NA	NA	NA	NA	NA	5.8
211-001-001	211-0001M	Mar-95	0.5 - 1	2,150	**1,500**	650	270 U	NA	NA	NA	NA	NA	NA	NA
211-001-002	211-0002M	Mar-95	0.5 - 1	8,900	**7,900**	1,000	2,700 U	NA	NA	NA	NA	NA	NA	NA
211-001-003	211-0003M	Mar-95	0.5 - 1	2,230	430	0.53 U	1,800	NA	NA	NA	NA	NA	NA	NA
211-001-004	211-0004M	Mar-95	0.5 - 1	90	24	0.52 U	66	NA	NA	NA	NA	NA	NA	NA
211-001-005	211-0005	Mar-95	0 - 0.5	2,820	**2,500 YJ**	320 ZJ	210 U	NA	NA	NA	NA	NA	NA	NA
211-001-005	211-0005M	Mar-95	0.5 - 1	2,180	**1,700**	480	260 U	NA	NA	NA	NA	NA	NA	NA
211-001-006	211-0006M	Mar-95	0.5 - 1	1,060	360	0.53 U	700	NA	NA	NA	NA	NA	NA	NA
211-001-007	211-0007M	Mar-95	0.5 - 1	160	2.2 U	0.53 U	160	NA	NA	NA	NA	NA	NA	NA
211-001-008	211-0008	Mar-95	0 - 0.5	**17,540**	**17,000 YJ**	540 ZJ	440 U	NA	NA	NA	NA	NA	NA	NA
211-001-008	211-0008M	Mar-95	0 - 0.5	13,810	**13,000**	810	5,600 U	NA	NA	NA	NA	NA	NA	NA
211-002-010	211-0012	Oct-95	1.5 - 2.5	ND	26 U	0.53 U	26 U	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
211-002-010	211-0013	Oct-95	5.5 - 6.5	ND	26 UJ	0.53 U	26 UJ	NA	0.011 U	0.001 J	0.011 U	0.011 U	NA	NA
211-002-011	211-0015	Oct-95	1 - 2	3,490	**3,000**	490 YJ	260 U	NA	0.01 U	0.01 U	0.01 U	0.003 J	NA	NA
211-002-011	211-0016	Oct-95	5.5 - 6.5	8,200	5,700	2,500 YJ	260 U	NA	1.3 U	1.3 U	4.7	2.6	NA	NA
211-002-012	211-0018	Oct-95	0.5 - 1	ND	26 U	0.52 U	26 U	NA	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
211-002-012	211-0019	Oct-95	5 - 5.5	ND	28 U	0.58 U	28 U	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
211-002-013	211-0021	Oct-95	1 - 2	0.78	25 U	0.78 ZJ	25 U	NA	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
211-002-013	211-0022	Oct-95	4.5 - 6.5	0.88	29 UJ	0.88 YJ	29 UJ	NA	0.012 U	0.012 U	0.012 U	0.012 U	NA	NA
211-002-014	211-0024	Oct-95	0.5 - 1	ND	NA	0.53 U	NA	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
211-002-014	211-0025	Oct-95	4.5 - 5.5	ND	29 UJ	0.58 U	29 UJ	NA	0.012 U	0.012 U	0.012 U	0.012 U	NA	NA
211-002-015	211-0027	Oct-95	1 - 2	ND	25 U	0.52 U	25 U	NA	0.001 J	0.01 U	0.01 U	0.01 U	NA	NA
211-002-015	211-0028	Oct-95	5 - 6	11,033	11,000	33 YJ	1,400 U	NA	1.4 U	1.4 U	1.4 U	1.4 U	NA	NA
211-IW-001	211I-001	Jan-95	5.5 - 6.5	260	12 U	0.6 U	260 YJ	NA	0.012 U	0.012 U	0.012 U	0.012 U	NA	2
211-IW-001	211I-001M	Jan-95	5.5 - 6.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
211-IW-002	211I-002	Jan-95	7 - 7.5	81	11 U	0.55 U	81 YJ	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	4.3
211-IW-002	211I-002M	Jan-95	7 - 7.5	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
211-IWCO-001	211C-001	Jan-95	1 - 2	10,240	**9,060 YJ**	**1,180 ZJ**	220 U	NA	0.054 U	0.017 J	0.19	0.12	NA	20.5
211-IWCO-001	211C-001M	Jan-95	1 - 2	NA	NA	NA	NA	NA	0.4 U	0.4 U	1.5	1.2	NA	25 U
211-SN-001	211S-001M	Jan-95	4 - 4.5	ND	50 U	50 U	NA	NA	0.01 U	0.01 U	0.01 U	0.03 U	NA	25 U
211-SS-001	211M-001M	Mar-95	2.5 - 3	**14,700**	**5,400**	**9,300**	NA	NA	0.2 U	0.39	0.2 U	1.2	NA	25 U
211-SS-002	211M-002M	Mar-95	2 - 2.5	9,100	**3,800**	**5,300**	NA	NA	0.59	0.2 U	0.2 U	0.6 U	NA	25 U
211-SS-003	211M-003M	Mar-95	2.5 - 3	**28,000**	**10,000**	**18,000**	NA	NA	0.37	0.33 U	16	1.2	NA	25 U
211-SS-004	211M-004M	Mar-95	3.5 - 4	**72,000**	**35,000**	**37,000**	NA	NA	0.5 U	0.5 U	8.6	3.6	NA	47
530-1-MOJ	530-P1-5.5	Aug-97	5.5	**23,300**	1,200 U	4,300	NA	19,000	1.2 U	1.2 U	1.2 U	2.5 U	6.2 U	NA

TABLE F-6-1: SOIL ANALYTICAL DATA - SITE 23

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
530-2-MOJ	530-P2-5.5	Aug-97	5.5	1,340	50 U	40	500 U	1,300	0.01 U	16	0.01 U	0.01 U	0.1 U	NA
530-3-MOJ	530-P3-5.5	Aug-97	5.5	**17,700**	100 U	1,700	1,000 U	16,000	0.5 U	0.5 U	0.5 U	0.75	5 U	NA
530-4-MOJ	530-P4-5.5	Aug-97	5.5	1,313	5 U	1,300	NA	13	0.25 U	0.25 U	0.25 U	0.5 U	1.2 U	NA
530-5-MOJ	530-P5-5.5	Aug-97	5.5	7,400	30 U	900	300 U	6,500	0.25 U	0.25 U	0.25 U	0.7	2.5 U	NA
530-6-MOJ	530-P6-6.0	Aug-97	6	ND	5 U	0.2 U	NA	10 U	0.001 U	0.001 U	0.001 U	0.002 U	0.05 U	NA
530-7-MOJ	530-P7-6.0	Aug-97	6	0.44	5 U	0.44	NA	10 U	0.001 U	0.001 U	0.001 U	0.002 U	0.05 U	NA
530-8-MOJ	530-P8-5.5	Aug-97	5.5	ND	1 U	1 U	NA	1 U	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	NA
530-9-MOJ	530-P9-6.0	Aug-97	6	ND	1 U	1 U	10 U	1 U	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	NA
530-10-MOJ	530-P10-6.0	Aug-97	6	ND	5 U	0.2 U	10 U	10 U	0.001 U	0.001 U	0.001 U	0.002 U	0.05 U	NA
530-11-MOJ	530-P11-4.5	Sep-97	4.5	5,800	50 U	800	500 U	5,000	0.125 U	0.125 U	0.125 U	1.7	0.2 U	NA
530-12-MOJ	530-P12-4.5	Sep-97	4.5	11,200	100 U	1,200	1,000 U	10,000	1 U	1 U	1 U	1.8	5 U	NA
530-13-MOJ	530-P13-4.5	Sep-97	4.5	ND	1 U	1 U	10 U	1 U	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	NA
530-14-MOJ	530-P14-4.5	Sep-97	4.5	ND	1 U	1 U	10 U	1 U	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	NA
530-15-MOJ	530-P15-4.5	Sep-97	4.5	**15,000**	100 U	2,000	1,000 U	13,000	2.5 U	2.5 U	2.5 U	2.5 U	25 U	NA
530-16-MOJ	530-P16-4.5	Sep-97	4.5	13,200	100 U	1,200	1,000 U	12,000	1.25 U	1.25 U	1.25 U	1.25 U	12.5 U	NA
530-17-MOJ	530-P17	Sep-97	-	8,600	100 U	**2,000**	1,000 U	**6,600**	1.25 U	1.25 U	1.25 U	0.94	12.5 U	NA
530-22-MOJ	530-P22-5.0	Oct-97	5	**21,100**	11,000	1,100	1,000 U	9,000	0.12 U	0.12 U	0.12 U	0.25 U	0.62 U	NA
530-25-MOJ	530-P25-5.0	Nov-97	5	**32,050**	17,000	1,300	750	13,000	0.25 U	0.25 U	0.25 U	0.5 U	1.2 U	NA
530-MJ-MW-1	530MW1-3.5	Nov-97	3.5	7,310	**4,100**	410	NA	**2,800**	0.12 U	0.12 U	0.12 U	0.25 U	0.62 U	NA
530-MJ-MW-2	530MW2-3.5	Nov-97	3.5	11,062	5 U	**2,462**	NA	**8,600**	0.001 U	0.001 U	0.001 U	0.002 U	0.005 U	NA
530-MJ-MW-3	530MW3-4.5	Dec-97	4.5	32	5 U	0.2 U	32	10 U	0.001 U	0.001 U	0.001 U	0.002 U	0.005 U	NA
B10B-04	280-S10B-001	Aug-94	0.5 - 1.5	NA	NA	NA	NA	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
B10B-04	280-S10B-002	Aug-94	2 - 3	NA	NA	NA	NA	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
B10B-04	280-S10B-003	Aug-94	5 - 6	NA	NA	NA	NA	NA	0.012 U	0.012 U	0.012 U	0.012 U	NA	NA
B10B-06	280-S10B-008	Aug-94	0.5 - 1.5	NA	NA	NA	NA	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
B10B-06	280-S10B-009	Aug-94	2.5 - 3.5	NA	NA	NA	NA	NA	0.012 U	0.012 U	0.012 U	0.012 U	NA	NA
B10B-06	280-S10B-010	Aug-94	5 - 6	NA	NA	NA	NA	NA	0.012 U	0.012 U	0.012 U	0.012 U	NA	NA
B10B-07	280-S10B-011	Aug-94	0.5 - 1.5	70	10 U	0.53 U	70 J	10 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
B10B-07	280-S10B-012	Aug-94	2.5 - 3.5	71	10 U	0.53 U	71 J	10 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
B10B-07	280-S10B-013	Aug-94	5 - 6	ND	11 U	0.57 U	29 U	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
B410-6	B410-6 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 U
B410-6	B410-6 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.005 U	0.038	0.005 U	0.005 U	NA	NA
B410-6	B410-6 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 U
B410-6	B410-6 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.6 U
B410-6	B410-6 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	0.006 U	0.028	0.006 U	0.006 U	NA	NA
B410-6	B410-6 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.1 U
B410-6	B410-6 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.006 U	0.021	0.006 U	0.006 U	NA	NA
B410-6	B410-6 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 U
B410-6	B410-6 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.006 U	0.023	0.006 U	0.006 U	NA	NA
B410-6	B410-6 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.8
B410-6	B410-6 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	0.006 U	0.031	0.006 U	0.006 U	NA	NA

TABLE F-6-1: SOIL ANALYTICAL DATA - SITE 23

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
B410-6	B410-6 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.2 U
BOR-12	BOR-12 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.7
BOR-12	BOR-12 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	0.005 U	0.016	0.005 U	0.005 U	NA	NA
BOR-12	BOR-12 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BOR-12	BOR-12 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.006 U	0.013	0.006 U	0.006 U	NA	NA
BOR-12	BOR-12 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.1
BOR-12	BOR-12 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.009 U	0.23	0.009 U	0.009 U	NA	NA
BOR-12	BOR-12 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31
BOR-12	BOR-12 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.009	0.006 U	0.006 U	NA	NA
BOR-12	BOR-12 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-20	BOR-20 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.6
BOR-20	BOR-20 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	0.005 U	0.015	0.005 U	0.005 U	NA	NA
BOR-20	BOR-20 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U
BOR-20	BOR-20 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	0.006 U	0.004 J	0.006 U	0.006 U	NA	NA
BOR-20	BOR-20 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-20	BOR-20 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	0.006 U	0.002 J	0.006 U	0.006 U	NA	NA
BOR-20	BOR-20 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.006 U	0.002 J	0.006 U	0.006 U	NA	6.1 U
BOR-20	BOR-20 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.6
BOR-22	BOR-22 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.4
BOR-22	BOR-22 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.006 U	0.017	0.006 U	0.006 U	NA	NA
BOR-22	BOR-22 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BOR-22	BOR-22 [7.5-8.0]	Jul-90	7.5 - 8	NA	NA	NA	NA	NA	0.006 U	0.021	0.006 U	0.006 U	NA	NA
BOR-22	BOR-22 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22
BOR-22	BOR-22 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.007 U	0.14	0.007 U	0.007 U	NA	NA
BOR-22	BOR-22 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	19
BOR-22	BOR-22 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.006	0.006 U	0.006 U	NA	NA
BOR-22	BOR-22 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
BOR-23	BOR-23 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.1 U
BOR-23	BOR-23 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	0.005 U	0.041	0.005 U	0.005 U	NA	NA
BOR-23	BOR-23 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.3
BOR-23	BOR-23 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.006 U	0.012	0.006 U	0.006 U	NA	NA
BOR-23	BOR-23 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BOR-23	BOR-23 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.009 U	0.13	0.009 U	0.009 U	NA	NA
BOR-23	BOR-23 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18.6
BOR-23	BOR-23 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	0.006 U	0.01	0.006 U	0.006 U	NA	NA
BOR-23	BOR-23 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BOR-25	BOR-25 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BOR-25	BOR-25 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.034	0.005 U	0.005 U	NA	NA
BOR-25	BOR-25 [3.5-4.0]	Jul-90	3.5 - 4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BOR-25	BOR-25 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	0.006 U	0.017	0.006 U	0.006 U	NA	NA
BOR-25	BOR-25 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U

TABLE F-6-1: SOIL ANALYTICAL DATA - SITE 23

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
BOR-25	BOR-25 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.006 U	0.02	0.006 U	0.006 U	NA	NA
BOR-25	BOR-25 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.9
BOR-25	BOR-25 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.006 U	0.011	0.006 U	0.006 U	NA	NA
BOR-25	BOR-25 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.4 U
BOR-26	BOR-26 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
BOR-26	BOR-26 [1.5-2.0]	Jul-90	1.5 - 2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BOR-26	BOR-26 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	120
BOR-26	BOR-26 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	0.006 U	0.004 J	0.006 U	0.006 U	NA	NA
BOR-26	BOR-26 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BOR-26	BOR-26 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA
BOR-26	BOR-26 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-26	BOR-26 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	0.006 U	0.009	0.006 U	0.006 U	NA	NA
BOR-26	BOR-26 [13.5-14.0]	Jul-90	13.5 - 14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
BOR-27	BOR-27 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BOR-27	BOR-27 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.005 U	0.095	0.005 U	0.005 U	NA	NA
BOR-27	BOR-27 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
BOR-27	BOR-27 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.008	0.006 U	0.006 U	NA	NA
BOR-27	BOR-27 [7.5-8.0]	Jul-90	7.5 - 8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-27	BOR-27 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	0.006 U	0.005 J	0.006 U	0.006 U	NA	NA
BOR-27	BOR-27 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
BOR-27	BOR-27 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	0.009 U	0.074	0.009 U	0.009 U	NA	NA
BOR-27	BOR-27 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14.7
CA13-10	030-CAP-202	Jun-00	4 - 4.5	61.7	7.7 J	0.58 U	54	NA	0.011 U	0.011 U	0.011 U	0.022 U	0.011 U	11 U
CA13-10	030-CAP-203	Jun-00	6.5 - 7	ND	1.2 U	0.61 U	12 U	NA	0.012 U	0.012 U	0.012 U	0.024 U	0.012 U	12 U
S23-DGS-DP01	385-S23-001	Aug-01	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12.5
M09-05	280-S09-001	Nov-94	1.5 - 2.5	NA	NA	NA	NA	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	1.3
M09-05	280-S09-002	Nov-94	3 - 4	NA	NA	NA	NA	NA	0.011 U	0.011 U	0.011 U	0.011 U	NA	1.4
M09-05	280-S09-003	Nov-94	5 - 6	NA	NA	NA	NA	NA	0.012 U	0.012 U	0.012 U	0.012 U	NA	2.6
M10B-01	280-S10B-134	Nov-94	1 - 2	ND	10 U	0.52 U	20 U	10 U	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
M10B-01	280-S10B-135	Nov-94	2 - 3	ND	11 U	0.53 U	21 U	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
M10B-01	280-S10B-136	Nov-94	3 - 4	30	11 U	0.53 U	30 J	11 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA
MW410-4	MW410-4 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.1 U
MW410-4	MW410-4 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	0.005 U	0.007	0.005 U	0.005 U	NA	NA
MW410-4	MW410-4 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
MW410-4	MW410-4 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	0.006 U	0.023	0.006 U	0.006 U	NA	NA
MW410-4	MW410-4 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U
MW410-4	MW410-4 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.006 U	0.007	0.006 U	0.006 U	NA	NA
MW410-4	MW410-4 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
MW410-4	MW410-4 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.006 U	0.01	0.006 U	0.006 U	NA	NA
MW410-4	MW410-4 [12.0-12.5]	Jul-90	12 - 12.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U

TABLE F-6-1: SOIL ANALYTICAL DATA - SITE 23

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
MW410-4	MW410-4 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	0.007 U	0.007	0.007 U	0.007 U	NA	NA
MW410-4	MW410-4 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.8
MW530-1	MW530-1 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31
MW530-1	MW530-1 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	0.006 U	0.077	0.006 U	0.006 U	NA	NA
MW530-1	MW530-1 [3.0-3.5]	Jul-90	3 - 3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	59
MW530-1	MW530-1 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW530-1	MW530-1 [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	0.006 U	0.008	0.006 U	0.006 U	NA	NA
MW530-1	MW530-1 [6.5-7.0]	Jul-90	6.5 - 7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15
MW530-1	MW530-1 [7.5-8.0]	Jul-90	7.5 - 8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25
MW530-1	MW530-1 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	0.03 U	0.038	0.036	0.17	NA	NA
MW530-1	MW530-1 [9.0-9.5]	Jul-90	9 - 9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15
MW530-1	MW530-1 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	0.75 U	6.2	12	NA	NA
MW530-1	MW530-1 [12.0-12.5]	Jul-90	12 - 12.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
MW530-1	MW530-1 [13.5-14.0]	Jul-90	13.5 - 14	NA	NA	NA	NA	NA	0.007 U	0.14	0.007 U	0.011	NA	NA
MW530-1	MW530-1 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18
MW530-2	MW530-2 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.4
MW530-2	MW530-2 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.006 U	0.072	0.006 U	0.006 U	NA	NA
MW530-2	MW530-2 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
MW530-2	MW530-2 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA
MW530-2	MW530-2 [5.5-6.0]	Jul-90	5.5 - 6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.4 U
MW530-2	MW530-2 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	0.006 U	0.008	0.006 U	0.006 U	NA	NA
MW530-2	MW530-2 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.3 U
MW530-2	MW530-2R [6.0-6.5]	Jul-90	6 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1 U
MW530-2	MW530-2 [11.0-11.5]	Jul-90	11 - 11.5	NA	NA	NA	NA	NA	0.006 U	0.01	0.006 U	0.006 U	NA	NA
MW530-2	MW530-2 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U
MW530-2	MW530-2 [14.0-14.5]	Jul-90	14 - 14.5	NA	NA	NA	NA	NA	0.005 U	0.031	0.005 U	0.005 U	NA	NA
MW530-2	MW530-2 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.3 U
MW530-3	MW530-3 [0.5-1.0]	Jul-90	0.5 - 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
MW530-3	MW530-3 [2.0-2.5]	Jul-90	2 - 2.5	NA	NA	NA	NA	NA	0.029 U	1.1	0.029 U	0.029 U	NA	NA
MW530-3	MW530-3 [2.5-3.0]	Jul-90	2.5 - 3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2 U
MW530-3	MW530-3 [4.0-4.5]	Jul-90	4 - 4.5	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA
MW530-3	MW530-3 [5.0-5.5]	Jul-90	5 - 5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
MW530-3	MW530-3 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.03	0.006 U	0.006 U	NA	NA
MW530-3	MW530-3 [8.0-8.5]	Jul-90	8 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U
MW530-3	MW530-3R [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U
MW530-3	MW530-3 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	NA	0.022	0.006 U	0.006 U	NA	NA
MW530-3	MW530-3 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18
MW530-3	MW530-3 [11.5-12.0]	Jul-90	11.5 - 12	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA
MW530-3	MW530-3 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.8
MWOR-5	MWOR-5 [1.0-1.5]	Jul-90	1 - 1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 U
MWOR-5	MWOR-5 [7.0-7.5]	Jul-90	7 - 7.5	NA	NA	NA	NA	NA	0.006 U	0.011	0.006 U	0.006 U	NA	NA

TABLE F-6-1: SOIL ANALYTICAL DATA - SITE 23

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Depth (feet)	TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Lead
MWOR-5	MWOR-5 [8.5-9.0]	Jul-90	8.5 - 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22.1
MWOR-5	MWOR-5 [10.0-10.5]	Jul-90	10 - 10.5	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA
MWOR-5	MWOR-5 [10.5-11.0]	Jul-90	10.5 - 11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22.8
MWOR-5	MWOR-5 [12.5-13.0]	Jul-90	12.5 - 13	NA	NA	NA	NA	NA	0.006 U	0.002 J	0.006 U	0.006 U	NA	NA
MWOR-5	MWOR-5 [13.0-13.5]	Jul-90	13 - 13.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.7
MWOR-5	MWOR-5 [14.5-15.0]	Jul-90	14.5 - 15	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U	NA	NA
MWOR-5	MWOR-5 [15.0-15.5]	Jul-90	15 - 15.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.1
S16-71	280-S16-017	Jul-94	0 - 0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3 J
S16-70	280-S16-016	Jul-94	0 - 0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	85.8 J
S16-69	280-S16-015	Jul-94	0 - 0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.6 J

Notes:

Bold	Indicates preliminary remediation criteria presented in Table F- 2-1 or free product criteria is exceeded.
J	Indicates an estimated concentration value
mg/kg	Milligrams per kilogram
MTBE	Methyl tertiary butyl ether
NA	Not analyzed
ND	Not detected
TPH	Total petroleum hydrocarbon
TPH-d	Total petroleum hydrocarbons as diesel
TPH-g	Total petroleum hydrocarbons as gasoline
TPH-mo	Total petroleum hydrocarbons as motor oil
TTPH	Total total petroleum hydrocarbons (sum of all TPH fractions)
U	Indicates compound was analyzed for but not detected above the concentration listed
UJ	Indicates compound was analyzed for but not detected above the estimated concentration listed
Y	Sample exhibits fuel pattern which does not resemble standard
Z	Sample exhibits unknown single peak or peaks

TABLE F-6-2: GROUNDWATER ANALYTICAL DATA - SITE 23

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	Concentration (mg/L)										
						TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
211-002-010	211-0011	Oct-95	9 - 9	1,491	72	0.29	0.29 YJ	0.05 U	0.3 U	NA	NA	NA	NA	NA	NA	NA
211-002-010	211-0011RS	Nov-95	9 - 9	1,491	72	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	NA
211-002-011	211-0014	Oct-95	9 - 9	1,398	16	**2.1**	NA	2.1 J	1.5 U	NA	NA	NA	NA	NA	NA	NA
211-002-011	211-0014RS	Nov-95	8 - 9	1,398	16	NA	NA	NA	NA	NA	**0.067 D**	0.011	0.02	0.008	NA	NA
211-002-012	211-0017	Oct-95	9 - 9	1,307	79	0.3	0.1 U	0.05 U	0.3 YJ	NA	NA	NA	NA	NA	NA	NA
211-002-012	211-0017RS	Nov-95	8 - 9	1,307	79	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	NA
211-002-013	211-0020	Oct-95	7.5 - 8.5	1,290	104	ND	0.1 U	0.05 U	0.2 U	NA	NA	NA	NA	NA	NA	NA
211-002-013	211-0020RS	Nov-95	8 - 8.5	1,290	104	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	NA
211-002-013	211-0029RS	Nov-95	8 - 9	1,290	104	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	NA
211-002-014	211-0023	Oct-95	9 - 9	1,203	196	ND	0.1 U	0.05 U	0.2 U	NA	NA	NA	NA	NA	NA	NA
211-002-014	211-0023RS	Nov-95	8 - 9	1,203	196	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	NA
211-002-015	211-0026	Oct-95	9 - 9	1,141	9	**5.8**	1 YJ	4.8 YJ	0.2 U	NA	NA	NA	NA	NA	NA	NA
211-002-015	211-0026RS	Nov-95	9 - 10	1,141	9	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	NA
530-1-MOJ*	530-P1W	Aug-97	*	1,152	32	**10**	0.5 U	4.8	NA	5.2	**0.011**	0.0025 U	0.0095	0.005 U	0.025 U	NA
530-2-MOJ*	530-P2W	Aug-97	*	1,135	31	**9.7**	0.25 U	3.1	1.25 U	6.6	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	NA
530-3-MOJ*	530-P3W	Aug-97	*	1,169	43	**158**	2.5 U	28	12.5 U	130	**0.18**	0.1 U	0.1 U	0.1 U	1 U	NA
530-4-MOJ*	530-P4W	Aug-97	*	1,132	50	**60.7**	0.5 U	8.7	NA	52	0.005 U	0.005 U	0.005 U	0.01 U	0.05 U	NA
530-5-MOJ*	530-P5W	Aug-97	*	1,156	58	**23.8**	0.5 U	3.8	NA	20	0.0005 U	0.005 U	0.0005 U	0.001 U	0.005 U	NA
530-6-MOJ*	530-P6W	Aug-97	*	1,172	76	0.68	0.68	0.05 U	NA	0.5 U	0.0005 U	0.005 U	0.0005 U	0.001 U	0.005 U	NA
530-7-MOJ*	530-P7W	Aug-97	*	1,222	78	**6**	2.6	1.1	NA	2.3	0.0005 U	0.0005	0.0005 U	0.0026	0.005 U	NA
530-8-MOJ*	530-P8W	Aug-97	*	1,232	61	0.29	0.05 U	0.14	0.25 U	0.15	0.0005 U	0.0009	0.0005 U	0.0005 U	0.005 U	NA
530-9-MOJ*	530-P9W	Aug-97	*	1,243	83	ND	0.05 U	0.05 U	0.25 U	0.05 U	0.0005 U	0.0022	0.0005 U	0.0008	0.005 U	NA
530-10-MOJ*	530-P10W	Aug-97	*	1,247	63	**3.8**	3.8	0.05 U	NA	0.5 U	0.0005 U	0.0005 U	0.0005 U	0.001 U	0.005 U	NA
530-11-MOJ*	530-P11W	Sep-97	*	1,187	32	**7.6**	4.4	3.2	2.5 U	0.5 U	10 U	0.01 U	0.01 U	0.01 U	0.1 U	NA
530-12-MOJ*	530-P12W	Sep-97	*	1,155	13	**151**	71	80	10 U	2 U	12.5 U	0.0125 U	0.0125 U	0.02	0.125 U	NA
530-13-MOJ*	530-P13W	Sep-97	*	1,121	9	**2.5**	0.05 U	0.05 U	2.5	0.05 U	0.005 U	0.0005 U	0.0005 U	0.0005 U	0.005 U	NA
530-14-MOJ*	530-P14W	Sep-97	*	1,104	19	1	0.05 U	0.05 U	1	0.05 U	0.005 U	0.0005 U	0.0005 U	0.0005 U	0.005 U	NA
530-15-MOJ*	530-P15W	Sep-97	*	1,114	24	**289**	1.25 U	230	12.5 U	59	0.02 U	0.02 U	0.02 U	0.0005 U	0.2 U	NA
530-16-MOJ*	530-P16W	Sep-97	*	1,119	27	0.76	0.05 U	0.33	0.25 U	0.43	0.005 U	0.0005 U	0.0005 U	0.0005 U	0.005 U	NA
530-17-MOJ*	530-P17W	Sep-97	*	1,142	39	**1.5**	0.05 U	0.05 U	1.5	0.05 U	0.005 U	0.0005 U	0.0005 U	0.0005 U	0.005 U	NA
530-18-MOJ*	530-P18W	Sep-97	*	1,186	81	ND	0.05 U	0.05 U	0.25 U	0.05 U	0.005 U	0.0005 U	0.0005 U	0.0005 U	0.005 U	NA
530-20-MOJ*	530-P20W	Sep-97	*	1,276	60	ND	0.05 U	0.05 U	0.25 U	0.05 U	0.005 U	0.0005 U	0.0005 U	0.0008	0.005 U	NA
530-22-MOJ*	530-P22W	Oct-97	*	1,152	10	**2.4**	1.2	0.05 U	1.2	0.5 U	0.005 U	0.0005 U	0.0005 U	0.001 U	0.005 U	NA
530-25-MOJ*	530-P25W	Nov-97	*	1,193	20	**50**	23	12	1.2 U	15	0.01 U	0.01 U	0.01 U	0.02 U	0.1 U	NA
530-MJ-MW-1	530-MJ-MW-1	Dec-97	1 - 15	1,212	7	**11**	6	0.9	0.25 U	4.1	**0.0081**	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-1	530-MJ-MW-1	Mar-98	1 - 15	1,212	7	**32.6**	18	1.6	0.25 U	13	**0.026**	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-1	530-MJ-MW-1	Sep-98	1 - 15	1,212	7	**49.6**	21	1.9	9.7	17	**0.0073**	0.0031	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-1	530-MJ-MW-1	Apr-99	1 - 15	1,212	7	0.489	NA	0.489	NA	NA	**0.0151**	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-1	385-S23-008	Jul-01	1 - 15	1,212	7	**1,360,000**	400,000 J	NA	200,000 J	760,000 J	1.3 UJ	1.3 UJ	1.3 UJ	0.66 J	2.5 UJ	NA
530-MJ-MW-2	530-MJ-MW-2	Dec-97	1 - 15	1,137	55	**26.2**	12	3.2	0.25 U	11	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-2	530-MJ-MW-2	Mar-98	1 - 15	1,137	55	**55**	26	1	0.25 U	28	0.0005 U	0.0005 U	0.0005 U	**11**	0.0025 U	NA
530-MJ-MW-2	530-MJ-MW-2	Sep-98	1 - 15	1,137	55	**24.4**	11	2.4	0.25 U	11	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-2	530-MJ-MW-2	Apr-99	1 - 15	1,137	55	NA	NA	1.04	NA	NA	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-2	385-S23-009	Jul-01	1 - 15	1,137	55	**24,000**	870 UJ	NA	870 UJ	24,000 J	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.2 UJ	NA
530-MJ-MW-3	530-MJ-MW-3	Dec-97	1 - 15	1,192	97	0.17	0.17	0.05 U	0.25 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-3	530-MJ-MW-3	Mar-98	1 - 15	1,192	97	0.068	0.068	0.05 U	0.25 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-3	530-MJ-MW-3	Sep-98	1 - 15	1,192	97	0.076	0.076	0.05 U	0.25 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-3	530-MJ-MW-3	Apr-99	1 - 15	1,192	97	ND	NA	0.05 U	NA	NA	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0025 U	NA
530-MJ-MW-3	385-S23-010	Jul-01	1 - 15	1,192	97	0.23	0.23	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
5-JF*	030-CAP-191	May-00	-	1,547	0	ND	0.1 U	0.057 UJ	0.5 U	NA	0.0005 U	0.0009	0.0005 U	0.0006 U	0.0005 U	0.003 UJ

TABLE F-6-2: GROUNDWATER ANALYTICAL DATA - SITE 23

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	Concentration (mg/L)										
						TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
CA13-07	030-CAP-200	Apr-00	3 - 8	1,417	14	**2.11**	0.1 U	0.91	0.5 U	1.2	**0.043**	0.002 U	0.017	0.002 U	0.002 U	0.003 U
CA13-08	030-CAP-200A	May-00	3 - 8	1,419	14	**239.8**	22 J	0.8	130 J	87 J	**0.043**	0.001 U	0.052	0.001 U	0.002 U	0.003 U
CA13-09	030-CAP-201	Apr-00	3 - 8	1,205	2	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	0.002 U	0.003 U
CA13-10	030-CAP-204	Jun-00	3 - 8	1,449	68	ND	0.1 U	0.056 UJ	0.5 U	NA	0.0005 U	0.001 U	0.001 U	0.002 U	0.002 U	0.003 U
D10B-01	280-S10B-138	Dec-94	50 - 60	1,143	2	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.02 U
D10B-01	280-S10B-141	Feb-95	50 - 60	1,143	2	ND	0.1 U	0.05 U	0.2 U	0.1 U	0.001 UJ	0.001 UJ	0.001 UJ	0.001 U	NA	0.005 U
D10B-01	280-S10B-142	Jun-95	50 - 60	1,143	2	0.18	0.18 J	0.05 U	0.2 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0065 U
D10B-01	280-S10B-143	Sep-95	50 - 60	1,143	2	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0055 U
D10B-01	385-S23-006	Jul-01	50 - 60	1,143	2	0.2	0.1 U	0.05 U	0.2	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
D10B-02	280-S10B-139	Dec-94	50 - 60	1,494	30	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.02 U
D10B-02	280-S10B-144	Feb-95	50 - 60	1,494	30	ND	0.1 U	0.05 U	0.2 U	0.1 U	0.001 UJ	0.001 UJ	0.001 UJ	0.001 U	NA	0.001 U
D10B-02	280-S10B-145	Jun-95	50 - 60	1,494	30	0.39	0.1 U	0.05 U	0.39 J	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
D10B-02	280-S10B-146	Sep-95	50 - 60	1,494	30	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
D10B-02	108-S23-001	Nov-97	50 - 60	1,494	30	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.00065 U
D10B-02	108-S23-003	Feb-98	50 - 60	1,494	30	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0006 UJ
D10B-02	108-S23-005	May-98	50 - 60	1,494	30	NA	NA	NA	NA	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0005 UJ
D10B-02	108-S23-007	Aug-98	50 - 60	1,494	30	NA	NA	NA	NA	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	0.0017 U
D10B-02	385-S23-007	Jul-01	50 - 60	1,494	30	ND	0.1 U	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
D10B-02	D10B-02-A1137	Jun-02	50 - 60	1,494	30	ND	0.05 UJ	0.026 U	0.3 UJ	0.05 UJ	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	2.9E-05 U
D10B-02	D10B-02-A1638	Dec-02	50 - 60	1,494	30	0.065	0.05 U	0.05 U	0.065 J	0.05 UJ	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00058 U
DHP-S09-04	280-S09-056	Aug-94	22	1,322	129	NA	NA	NA	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S10B-01	280-S10B-110	Jul-94	40	1,498	10	**8.25**	7.62 J	0.63 J	0.5 U	0.1 U	**0.028**	0.001	0.009	0.054	NA	0.0012 UJ
DHP-S10B-02	280-S10B-111	Jul-94	33	1,758	12	0.53	0.1 UJ	0.05 U	0.53 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	**0.0126**
DHP-S10B-03	280-S10B-112	Jul-94	24	1,143	13	0.89	0.1 UJ	0.05 U	0.89 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	**0.0557**
DHP-S10B-04	280-S10B-114	Jul-94	24.5	1,222	48	**2.65**	0.1 UJ	0.05 U	2.65	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S10B-05	280-S10B-115	Jul-94	21	1,428	66	ND	0.1 UJ	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0012 U
DHP-S13-05	280-S13-076	Aug-94	13.5 - 17	1,552	333	0.26	0.1 U	0.05 U	0.26 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0019 UJ
M09-05	280-S09-044	Nov-94	3.5 - 10	1,255	73	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
M09-05	280-S09-046	Feb-95	3.5 - 10	1,255	73	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 UJ	0.001 U	0.001 U	0.001 U	NA	0.001 U
M09-05	280-S09-047	Jun-95	3.5 - 10	1,255	73	0.28	0.1 U	0.05 U	0.28 J	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
M09-05	280-S09-048	Aug-95	3.5 - 10	1,255	73	ND	0.1 U	0.05 U	0.2 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
M09-05	385-S09-029	Jun-01	3.5 - 10	1,255	73	0.04	0.1 U	0.04 J	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
M10B-01	280-S10B-140	Dec-94	3 - 11	1,500	26	1.1	0.1 U	0.05 U	1.1 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
M10B-01	280-S10B-147	Feb-95	3 - 11	1,500	26	0.48	0.1 U	0.05 U	0.48 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.001 U
M10B-01	280-S10B-148	Jun-95	3 - 11	1,500	26	0.62	0.1 U	0.05 U	0.62 J	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
M10B-01	280-S10B-149	Aug-95	3 - 11	1,500	26	0.85	0.85 J	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
M10B-01	030-CAP-198	Apr-00	3 - 11	1,500	26	ND	0.1 UJ	0.05 U	0.5 UJ	0.1 UJ	0.0005 U	0.001 U	0.001 U	0.001 U	0.002 U	0.003 U
M10B-01	385-S23-005	Jul-01	3 - 11	1,500	26	0.51	0.51 D	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
M10B-01	M10B-01-A1143	Jun-02	3 - 11	1,500	26	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 UJ	0.00031 J
M10B-01	M10B-01-A1342	Sep-02	3 - 11	1,500	26	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0002 U	NA
M10B-01	M10B-01-A1644	Dec-02	3 - 11	1,500	26	ND	0.05 U	0.05 U	0.3 U	0.05 UJ	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00035 U
M10B-01	M10B-01-A1995	Apr-03	3 - 11	1,500	26	ND	0.05 U	0.026 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	NA
MW410-4	MW410-4	Aug-90	5 - 15	1,310	123	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	**0.058**
MW410-4	280-S09-040	Oct-94	5 - 15	1,310	123	0.62	0.1 U	0.05 U	0.62 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MW410-4	280-S09-041	Feb-95	5 - 15	1,310	123	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.001 UJ	0.001 U	0.001 U	0.001 U	NA	0.001 U
MW410-4	280-S09-042	Jun-95	5 - 15	1,310	123	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MW410-4	280-S09-043	Aug-95	5 - 15	1,310	123	ND	0.1 U	0.05 U	0.2 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MW410-4	MW410-4-A1152	Jun-02	5 - 15	1,310	123	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 UJ	2.9E-05 J
MW410-4	MW410-4-A1346	Sep-02	5 - 15	1,310	123	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	NA
MW410-4	MW410-4-A1653	Dec-02	5 - 15	1,310	123	ND	0.05 U	0.05 U	0.3 U	0.05 UJ	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00026 U

TABLE F-6-2: GROUNDWATER ANALYTICAL DATA - SITE 23

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

Point Name	Sample Identification	Sample Date	Sample Depth (feet)	Distance to Shoreline (feet)	Distance to Storm Drain (feet)	Concentration (mg/L)										
						TTPH	TPH-d	TPH-g	TPH-mo	Jet Fuel	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Lead
MW410-4	MW410-4-A1999	Apr-03	5 - 15	1,310	123	ND	0.05 U	0.018 U	0.3 U	0.05 U	0.0005 U		0.0005 U	0.0005 U	0.0005 U	NA
MW530-1	MW530-1	Aug-90	5 - 15	1,758	20	NA	NA	NA	NA	NA	**0.019**	0.007	0.079	0.19	NA	**0.36**
MW530-1	280-S10B-017	Oct-94	5 - 15	1,758	20	**5.49**	4.82 J	0.67 J	0.2 U	0.1 U	0.001 U	0.0009 J	0.002	0.023	NA	0.0015 U
MW530-1	280-S10B-018	Feb-95	5 - 15	1,758	20	**4.6**	3.5 J	1.1 J	0.2 U	0.1 U	**0.001 J**	0.003 J	0.007 J	0.052	NA	0.001 U
MW530-1	280-S10B-020	Jun-95	5 - 15	1,758	20	**7.9**	0.1 U	1.1	6.8 J	0.1 U	**0.001**	0.005	0.014	0.07	NA	0.0013 U
MW530-1	280-S10B-021	Aug-95	5 - 15	1,758	20	**5.3**	4.4 J	0.9 J	0.5 U	0.1 U	0.0008	0.004	0.015	0.07 J	NA	0.0011 U
MW530-1	030-CAP-197	Apr-00	5 - 15	1,758	20	**1.58**	0.16	0.1	1.2	0.12	0.0005 U	0.001 U	0.0016	0.0044	0.002 U	0.0035
MW530-1	385-S23-002	Jul-01	5 - 15	1,758	20	1.1	0.99 D	0.11 H	0.1 U	0.1 U	0.001 U	0.004 U	0.003 J	0.007	0.01 U	NA
MW530-2	MW530-2	Aug-90	5 - 15	1,335	68	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	**0.11**
MW530-2	280-S10B-022	Oct-94	5 - 15	1,335	68	0.79	0.1 U	0.05 U	0.79 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MW530-2	280-S10B-023	Feb-95	5 - 15	1,335	68	0.49	0.1 U	0.05 U	0.49 J	0.1 U	0.001 UJ	0.001 UJ	0.001 UJ	0.001 U	NA	0.001 U
MW530-2	280-S10B-024	Jun-95	5 - 15	1,335	68	0.69	0.1 U	0.05 U	0.69 J	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MW530-2	280-S10B-025	Aug-95	5 - 15	1,335	68	0.5	0.5 J	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MW530-2	108-S23-002	Nov-97	5 - 15	1,335	68	1	1 J	0.05 U	0.8 UJ	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.00065 U
MW530-2	108-S23-004	Feb-98	5 - 15	1,335	68	0.84	0.54 J	0.05 U	0.3 J	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0006 U
MW530-2	108-S23-006	May-98	5 - 15	1,335	68	0.436	0.4 J	0.036 J	0.24 UJ	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.00076 UJ
MW530-2	108-S23-008	Aug-98	5 - 15	1,335	68	1.23	0.76 J	0.05 U	0.47 J	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	**0.0239**
MW530-2	385-S23-003	Jul-01	5 - 15	1,335	68	0.2	0.2 D	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MW530-2	MW530-2-A1154	Jun-02	5 - 15	1,335	68	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 UJ	7.5E-05 J
MW530-2	MW530-2-A1655	Dec-02	5 - 15	1,335	68	0.055	0.055 y	0.05 U	0.3 U	0.05 UJ	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00031 U
MW530-3	MW530-3	Aug-90	5 - 15	1,133	9	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	0.2 U
MW530-3	280-S10B-026	Oct-94	5 - 15	1,133	9	0.57	0.1 U	0.05 U	0.57 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MW530-3	280-S10B-027	Feb-95	5 - 15	1,133	9	0.22	0.1 U	0.05 U	0.22 J	0.1 U	0.001 UJ	0.001 UJ	0.001 UJ	0.001 U	NA	0.001 U
MW530-3	280-S10B-028	Jun-95	5 - 15	1,133	9	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MW530-3	280-S10B-029	Aug-95	5 - 15	1,133	9	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 U
MW530-3	385-S23-004	Jul-01	5 - 15	1,133	9	0.44	0.44 D	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
MW530-3	MW530-3-A1155	Jun-02	5 - 15	1,133	9	ND	0.05 U	0.05 U	0.3 U	0.05 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 UJ	0.003 U
MW530-3	MW530-3-A1656	Dec-02	5 - 15	1,133	9	0.411	0.24	0.021 J	0.3 U	0.15 y	0.0002 J	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00024 U
MWOR-5	MWOR-5	Aug-90	5 - 15	1,550	340	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U	NA	**0.055**
MWOR-5	280-S13-050	Oct-94	5 - 15	1,550	340	**2.72**	0.1 U	0.05 U	2.72 J	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.0015 U
MWOR-5	280-S13-051	Feb-95	5 - 15	1,550	340	ND	0.1 U	0.05 U	0.2 U	0.1 U	0.001 U	0.001 U	0.001 U	0.001 U	NA	0.001 U
MWOR-5	280-S13-052	Jun-95	5 - 15	1,550	340	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0013 U
MWOR-5	280-S13-053	Aug-95	5 - 15	1,550	340	ND	0.1 U	0.05 U	0.5 U	0.1 U	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 UJ
MWOR-5	108-S13-003	Nov-97	5 - 15	1,550	340	0.029	0.1 UJ	0.029 J	0.3 U	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.00065 U
MWOR-5	108-S13-007	Feb-98	5 - 15	1,550	340	0.21	0.12 UJ	0.05 U	0.21 J	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0011 UJ
MWOR-5	108-S13-011	May-98	5 - 15	1,550	340	0.042	0.12 U	0.042 J	0.24 U	NA	0.0005 U	0.001 U	0.001 U	0.001 U	NA	0.0014 UJ
MWOR-5	108-S13-015	Aug-98	5 - 15	1,550	340	ND	0.12 UJ	0.05 UJ	0.24 UJ	NA	0.0005 UJ	0.001 UJ	0.001 UJ	0.001 UJ	NA	0.0029 J
MWOR-5	385-S13-005	Jun-01	5 - 15	1,550	340	ND	0.1 U	0.05 U	0.1 U	0.1 U	0.0005 U	0.002 U	0.002 U	0.002 U	0.005 U	NA
S23-DGS-VE01	385-S23-015	Aug-01	8 - 10	1,447	8	**2.93**	2.8 J	0.13 J	0.2 U	NA	0.001 U	0.001 U	0.001 U	0.0014 U	0.001 U	NA
S23-DGS-VE02	385-S23-023	Aug-01	7	1,350	9	ND	0.2 U	NA	0.2 U	NA	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	NA
SHP-S10B-05	280-S10B-127	Aug-94	5 - 8.5	1,425	65	**4.08**	0.1 U	0.46 J	3.62 J	0.1 U	0.05 U	0.2 U	0.2 U	0.2 U	NA	0.0012 U
SHP-S10B-06	280-S10B-128	Aug-94	4.5 - 8	1,470	186	1.24	1.24 J	0.05 U	0.5 U	0.1 U	0.0005	0.0005 UJ	0.002 U	0.002 U	NA	0.0012 U

Notes:

*	Well construction details are not available
J	Indicates an estimated concentration value
M	Pattern resembles motor oil pattern
mg/L	Milligrams per liter
MTBE	Methyl tertiary butyl ether
NA	Not analyzed
ND	Not detected
TPH	Total petroleum hydrocarbon
TPH-d	Total petroleum hydrocarbons as diesel
TPH-g	Total petroleum hydrocarbons as gasoline
TPH-mo	Total petroleum hydrocarbons as motor oil
TTPH	Total total petroleum hydrocarbons (sum of all TPH fractions)
U	Indicates compound was analyzed for but not detected above the concentration listed
UJ	Indicates compound was analyzed for but not detected above the estimated concentration listed
Y	Resembles a fuel pattern but does not match the standard

TABLE F-6-3: LOW-RISK FUEL SITE CLOSURE ASSESSMENT CERCLA SITE 23

Appendix F - TPH Risk Evaluation for CERCLA Sites 9, 13, 19, and 23

RWQCB LOW-RISK FUEL SITE CLOSURE CRITERIA	CRITERIA MET	EXPLANATION
The leak and source(s) have been removed	False	Since April 1997, Alameda Point ceased all naval operations; thereby eliminating possible sources of contamination associated with aircraft maintenance and operation activities. In addition, all aboveground storage tanks have been removed from CERCLA Site 23. However, floating product (a possible groundwater source) is present at CERCLA Site 23 and corrective actions (full-scale dual vapor extraction pilot study) are underway.
The site has been adequately characterized	True	Multiple investigations that assessed possible TPH contamination were conducted at Site 23 (see Table 6-1 and 6-2). Soil and groundwater have been adequately characterized and additional design data have been collected to support the pilot study.
Little or no groundwater impact currently exists, and no contaminants are found at levels above applicable water quality objectives	False	The site is located greater than 250 feet from the shoreline and TTPH and TPH-associated constituents would not be a threat to marine ecological receptors except for the storm drain exposure pathway. TTPH and TPH-associated constituents exceeded PRC for potential exposure to marine ecological receptors through the storm drain exposure pathway.
No water wells, deeper drinking water aquifers, surface water, or other sensitive receptors are likely to be impacted	False	Although no drinking water wells are located within Site 23, and groundwater at Site 23 does not discharge to surface water; groundwater at Site 23 is designated as part of the southeastern region, and is considered a potential drinking water source. TPH-associated constituents (benzene, xylenes, and lead) exceeded PRC for groundwater as a potential drinking water source.
The site presents no significant risk to human health	False	Potential reuse for Site 23 includes residential homes mixed with offices, retail, service commercial, research and development, or light industrial areas. TPH-fractions, and TPH-associated constituents in soil were screened against PRC for residential reuse, and TPH-associated constituents in groundwater were screened against residential PRC for volatilization of constituents to indoor air. TPH-fractions in soil and TPH-associated constituents in groundwater did exceed the site-specific PRC for residential use and inhalation of indoor air.
The site presents no significant risk to the environment	False	Based on exposure pathways evaluated for marine ecological receptors through the storm drain exposure pathway, TTPH and TPH-associated constituent concentrations in groundwater indicate that there is significant risk to the environment.

APPENDIX G
SOLID WASTE MANAGEMENT UNIT EVALUATION FOR OU-2A

A-E CERCLA/RCRA/UST Contract Number N68711-03-D-5104
Contract Task Order 0012

Draft Final

APPENDIX G
SOLID WASTE MANAGEMENT UNIT EVALUATION REPORT FOR OPERABLE UNIT 2A (SITES 9, 13, 19, 22, AND 23)

HAZARDOUS WASTE PERMIT EPA ID NUMBER CA 2170023236, NAVAL AIR STATION ALAMEDA
Alameda Point, Alameda, California

February 18, 2005

Prepared for

NAVFAC
Naval Facilities Engineering Command

DEPARTMENT OF THE NAVY
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ACRONYMS AND ABBREVIATIONS

AOC	Area of concern
AST	Aboveground storage tank
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DTSC	California Environmental Protection Agency Department of Toxic Substances Control
EBS	Environmental baseline survey
EPA	U.S. Environmental Protection Agency
GAP	Generator accumulation point
ID	Identification
NAS	Naval Air Station
Navy	U.S. Department of the Navy
NFA	No further action
OU	Operable unit
OWS	Oil-water separator
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SulTech	A joint venture of Sullivan Consulting Group and Tetra Tech EM Inc.
SWMU	Solid waste management unit
Tetra Tech	Tetra Tech EM Inc.
TPH	Total petroleum hydrocarbon
UST	Underground storage tank

EXECUTIVE SUMMARY

The U.S. Department of the Navy (Navy), Base Realignment and Closure Program Management Office West, requested that SulTech, a joint venture of Sullivan Consulting Group and Tetra Tech EM Inc., prepare this solid waste management unit (SWMU) evaluation report to summarize the results of all past assessments and investigations of the SWMUs within the operable unit (OU) 2A (Sites 9, 13, 19, 22, and 23) at Alameda Point (formerly Naval Air Station [NAS] Alameda), in Alameda County, California. This report was prepared in accordance with Contract Task Order 0012, issued under the Architectural-Engineering Services to Provide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Resource Conservation and Recovery Act (RCRA)/Underground Storage Tank (UST) Studies, Contract Number N68711-03-D-5104.

There are 24 SWMUs within CERCLA Sites 9, 13, 19, 22, and 23 in OU-2A; all are inactive and are being addressed under the Navy's CERCLA program. This evaluation report includes a recommendation of either no further action (NFA) or further action for each of these SWMUs, and it recommends that 11 of these SWMUs be integrated with the Navy's Total Petroleum Hydrocarbon (TPH) program due to the absence of CERCLA contaminants at these SWMUs. All recommendations in this report are based on the analysis and analytical results presented in Section G.3.0. Any corrective action that is required will be conducted under the CERCLA program or under the TPH program. The Navy is requesting concurrence on the recommendations for each of these SWMUs.

The SWMUs addressed in this report were evaluated using the requirements stipulated in the final hazardous waste facility permit for former NAS Alameda (U.S. Environmental Protection Agency [EPA] Identification Number CA 2170023236) to support further corrective action decisions at Alameda Point. The results of this evaluation showed that 8 of the 24 SWMUs within OU-2A are recommended for NFA. Four other SWMUs are recommended for further action under the CERCLA program, 11 are recommended for integration with the TPH program, and one already was closed with concurrence from the California Environmental Protection Agency Department of Toxic Substances Control. The Navy is requesting concurrence on these recommendations.

G.1.0 INTRODUCTION

The U.S. Department of the Navy (Navy), Base Realignment and Closure Program Management Office West, requested that SulTech, a joint venture of Sullivan Consulting Group and Tetra Tech EM Inc. (Tetra Tech), prepare this solid waste management unit (SWMU) evaluation report to summarize the results of all past assessments and investigations of the SWMUs within operable unit (OU) 2A (Sites 9, 13, 19, 22, and 23) at Alameda Point (formerly Naval Air Station [NAS] Alameda), in Alameda County, California. This report was prepared in accordance with Contract Task Order 0012, issued under the Architectural-Engineering Services to Provide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/ Resource Conservation and Recovery Act (RCRA)/Underground Storage Tank (UST) Studies, Contract Number N68711-03-D-5104.

All of the SWMUs within OU-2A are inactive and being addressed under the Navy's CERCLA program. For each of these SWMUs, this evaluation report includes a recommendation of either continued management under the CERCLA program or integration with the TPH program; also, each SWMU is recommended for either no further action (NFA) or further action. All recommendations are based on the analytical results presented in Section G.3.0. The Navy is requesting concurrence on the recommendations for each SWMU.

This evaluation report describes procedures, methods, and results of facility assessments and investigations of the SWMUs in OU-2A (Sites 9, 13, 19, 22, and 23) and describes the general approach to investigating and evaluating potential remedies pertaining to SWMU corrective measures and closure at Alameda Point. This evaluation report is provided as an appendix to the remedial investigation (RI) report for OU-2A (Sites 9, 13, 19, 22, and 23).

The SWMUs addressed in this report were evaluated using the requirements stipulated in the final hazardous waste facility permit for former NAS Alameda (U.S. Environmental Protection Agency [EPA] Identification [ID] Number CA 2170023236) to support further corrective action decisions at Alameda Point (California Environmental Protection Agency Department of Toxic Substances Control [DTSC] 1993).

The remainder of this report is divided into four sections. Section G.2.0 provides background information and the Navy's approaches for evaluating the SWMUs at Alameda Point. Section G.3.0 presents an evaluation for the SWMUs within OU-2A (Sites 9, 13, 19, 22, and 23), and Section G.4.0 summarizes recommendations for those SWMUs. Finally, Section G.5.0 provides the references used to prepare this evaluation report.

G.2.0 BACKGROUND AND APPROACHES FOR EVALUATIONS OF SOLID WASTE MANAGEMENT UNITS

SWMU means any unit at a hazardous waste facility from which hazardous constituents might migrate, irrespective of whether the unit was intended for the management of wastes (Title 22 *California Code of Regulations* Section 66260.10). At Alameda Point, SWMUs include areas of concern (AOC), generator accumulation points (GAP), CERCLA sites, oil-water separators (OWS), aboveground storage tanks (AST), USTs, washdown areas, and miscellaneous sites.

The following sections describe the history of SWMU assessments and investigations at Alameda Point (see Figure G2-1), and the Navy's approaches for ensuring that the results of those assessments and investigations are evaluated in a manner consistent with RCRA requirements.

G.2.1 HISTORY OF SOLID WASTE MANAGEMENT UNIT ASSESSMENTS AND INVESTIGATIONS

Most of the SWMUs at Alameda Point were first identified in 1991 in an initial RCRA facility assessment (RFA) (DTSC 1992), which was required to obtain a permit for the management of hazardous wastes in a number of specific management units no longer in operation at Alameda Point. According to Sections V.F through V.J of the final hazardous waste facility permit for Alameda Point (EPA ID CA 2170023236), information to support corrective action decisions regarding each SWMU was to be collected and submitted to DTSC. The permit described a typical RCRA corrective action process, which involves an analysis of RFA data to determine which SWMUs require further evaluation in a RCRA facility investigation (RFI), and requires the Navy to identify additional SWMUs, as appropriate, and include them in the corrective action process.

The initial RFA identified 151 SWMUs and concluded that a number of the SWMUs would need further investigation under an RFI, which is usually conducted under a series of RCRA permit modifications. After the final RCRA permit was issued, however, the Navy and the regulatory agencies determined that the most efficient and effective approach for assessing any additional SWMUs and conducting RFIs would be to take advantage of functionally equivalent investigations that were and continue to be conducted under a number of other Navy environmental programs. Types of investigations include environmental baseline survey (EBS) investigations under the Base Realignment and Closure property transfer program; investigations of possible releases of total petroleum hydrocarbons (TPH) from sources such as pipelines, USTs, and ASTs under the TPH program; and site investigations and RIs under the CERCLA program. Subsequent to the RFA and as a result of the investigations described previously, 215 additional SWMUs were identified and assessed at Alameda Point. These additional SWMUs were included in the final supplemental EBS (Tetra Tech 2003).

The Navy received a letter dated November 1999 from DTSC with comments on the SWMUs following their review of the draft EBS; the final EBS was submitted in 2001 (International Technology Corporation 2001). For some of the SWMUs, DTSC concurred with the recommendation in the EBS for NFA. For most of the SWMUs located within a CERCLA site, DTSC withheld concurrence with NFA, pending resolution of each site's RI report (DTSC 1999).

Recognizing that the investigation and management of SWMUs had been divided among a number of Navy programs, the Navy developed a SWMU evaluation approach coupled with a SWMU integration approach to ensure that all the SWMUs at Alameda Point would be managed under the appropriate Navy program and would receive appropriate response actions. These two SWMU approaches are described in Sections G.2.2 and G.2.3 of this report.

G.2.2 SOLID WASTE MANAGEMENT UNIT EVALUATION APPROACH

The SWMU evaluation approach is a three-step process that begins by listing the SWMUs identified and investigated under each Navy program. In the next step, a SWMU profile is compiled for each SWMU; these profiles consist of descriptive information on each SWMU, the name of the Navy program that provided the functional equivalent of an RFA (and in some cases, an RFI) for the SWMU, and the results of all investigations conducted on that SWMU, including figures and tables, as needed. In the final step, each SWMU profile is analyzed to determine whether the functional equivalents of the elements of a RCRA corrective action process have been conducted and whether any additional actions are needed.

G.2.3 SOLID WASTE MANAGEMENT UNIT INTEGRATION APPROACH

The purpose of the SWMU integration approach is to facilitate appropriate actions for all SWMUs under the appropriate Navy and regulatory programs. The approach allows final decisions to be made for basewide integration concerning each SWMU, such that petroleum-related SWMUs are addressed under the TPH program and most other SWMUs are addressed under the CERCLA program. Under the integration approach, any RCRA corrective action requirements for the SWMUs will be complied with under CERCLA remedial actions or under TPH corrective actions. Figure G2-2 shows the SWMU integration approach.

Based on an evaluation of each of the SWMU profiles according to the steps in the SWMU evaluation process (see Section G.2.2), the Navy is recommending either NFA or further action for each SWMU. If further action is recommended, future RCRA corrective action requirements for the SWMUs will be complied with under the appropriate Navy program. On an ongoing basis, the SWMUs will be evaluated to determine whether a SWMU has been or is being investigated under the appropriate Navy program. If a SWMU is found to be in the wrong program, it will be moved to the appropriate program.

Before developing the integration approach, the Navy and the regulators had decided that the "regulated" waste management units originally included in the interim status document and final permit for Alameda Point (EPA ID CA 2170023236) would continue to be investigated and closed under the Navy's RCRA program, with oversight from DTSC. These regulated units are, therefore, not included in the integration approach and are not described in this report.

As a result of the SWMU integration approach, the SWMUs located within OU-2A (Sites 9, 13, 19, 22, and 23) and integrated with the CERCLA program are evaluated in this appendix to the RI report. Table G2-1 lists the SWMUs that are addressed in this report, including OWS 588, associated with Industrial Waste Treatment Plant 410 which received closure from the DTSC on November 9, 1998. In addition, several SWMUs located within OU-2A (Sites 9, 13, 19, 22, and 23) are recommended for integration with the TPH program. The SWMUs recommended for integration with the TPH program are listed in Table G2-2 and are evaluated in Table G3-1.

The SWMU integration approach was submitted to DTSC in May 2004 for review; DTSC has not yet made a decision to accept the integration approach.

G.3.0 SOLID WASTE MANAGEMENT UNIT EVALUATION

Figure G3-1 shows the location of all of the SWMUs within OU-2A (Sites 9, 13, 19, 22, and 23). Table G3-1 presents SWMU profiles for each of the SWMUs in OU-2A integrated with the CERCLA program. Each profile provides descriptive information on a SWMU, identifies the Navy program under which the SWMU was investigated, and presents the investigation results. Each profile also recommends either NFA or further action. Many of the profiles reference a figure for CERCLA Sites 9, 13, 19, 22, or 23 (see Figures G3-2 through G3-5) that provides analytical data from soil or groundwater samples collected near the SWMU to examine potential sources of contamination and migration pathways. The analytical results are compared to appropriate screening levels for each chemical, which include TPH preliminary remediation criteria listed in the closure strategy for petroleum-contaminated sites (Navy 2001), residential preliminary remediation goals for soil (EPA 1996, 2002, 2004), background concentrations for metals in soil (Tetra Tech 2001b), or maximum contaminant levels for groundwater (California Department of Health Services 2003). A comprehensive set of data tables with soil and groundwater analytical results is provided in Appendix E of the RI report for OU-2A (Sites 9, 13, 19, 22, and 23).

G.4.0 RECOMMENDATIONS

Based on the information presented in Section G.3.0, 13 SWMUs are recommended for integration with the CERCLA program, including 8 SWMUs recommended for NFA, 1 SWMU (OWS 588) closed by DTSC on November 9, 1998, and 4 SWMUs recommended for further action under CERCLA. Eleven SWMUs are recommended for integration with the TPH program. The Navy is requesting concurrence on these recommendations.

G.5.0 REFERENCES

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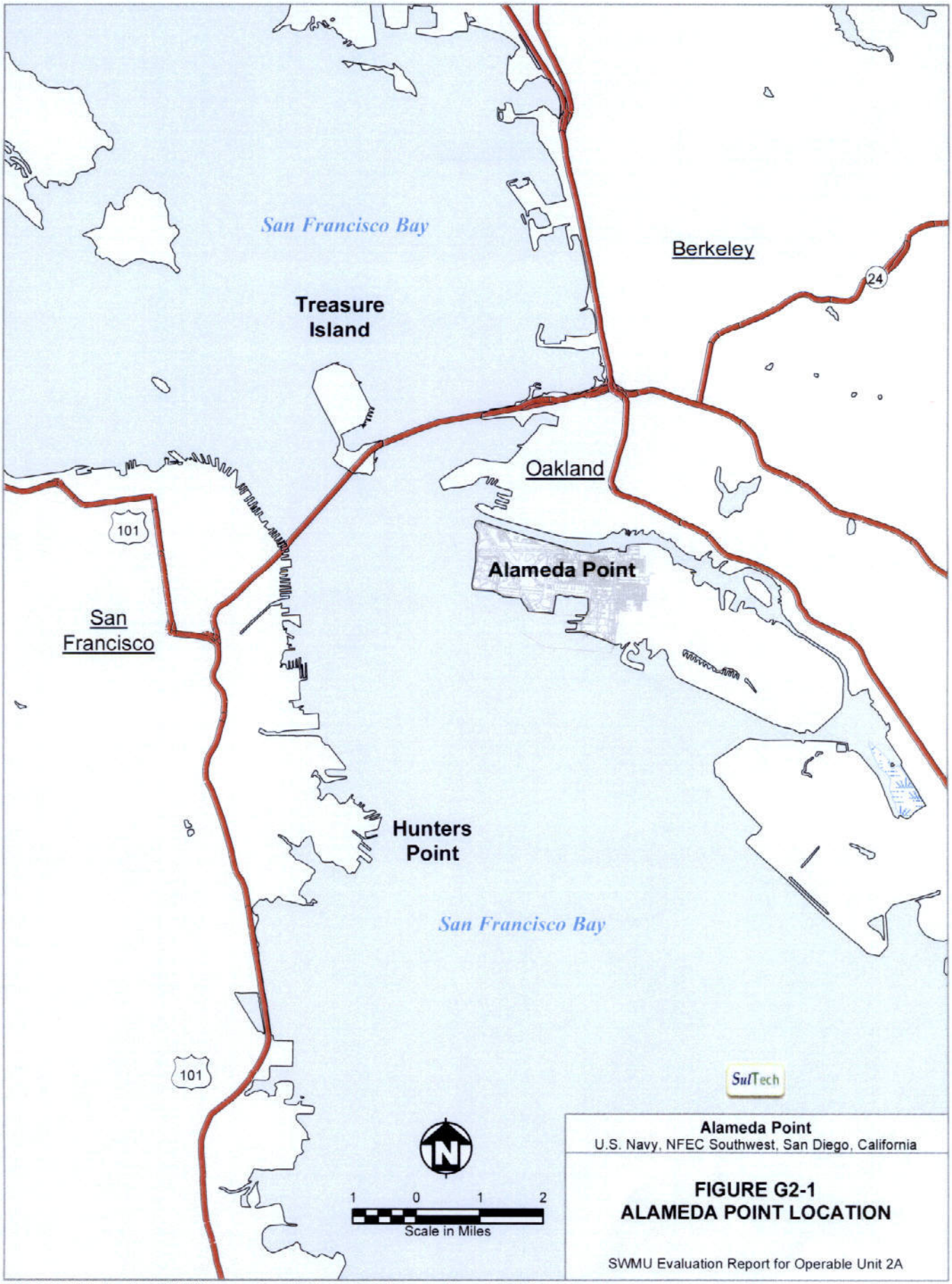
FIGURES



Alameda Point
U.S. Navy, NFEC Southwest, San Diego, California

FIGURE G2-1
ALAMEDA POINT LOCATION

SWMU Evaluation Report for Operable Unit 2A

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APPENDIX G – SOLID WASTE MANAGEMENT UNIT EVALUATION FOR OU-2A

FIGURE G2-2
SOLID WASTE MANAGEMENT UNIT INTEGRATION APPROACH

AS PER RPM, THIS FIGURE CANNOT BE RECOVERED.

FINAL REMEDIAL INVESTIGATION REPORT
SITES 9, 13, 19, 22, AND 23
OPERABLE UNIT 2A (OU-2A)

QUESTIONS MAY BE DIRECTED TO:

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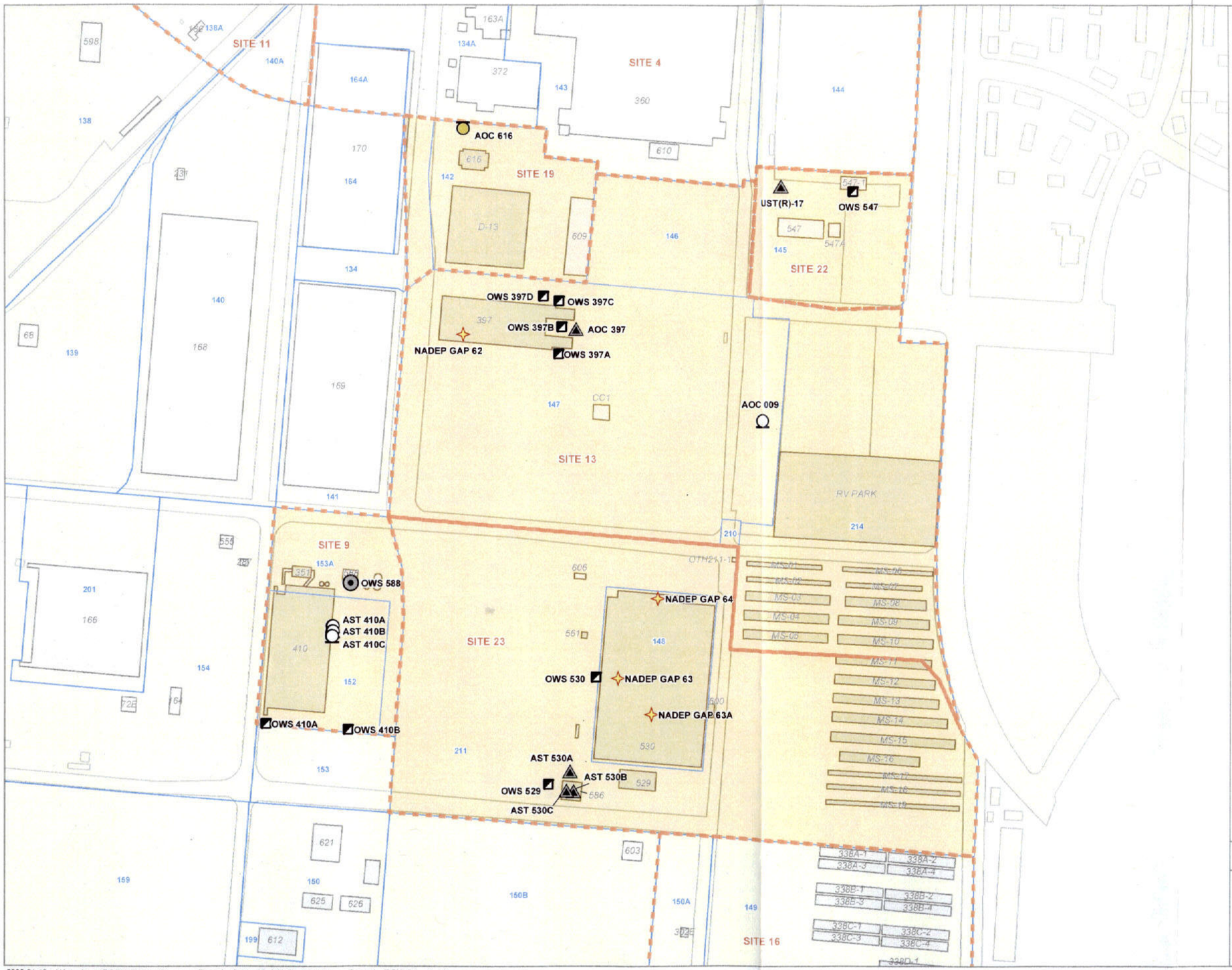
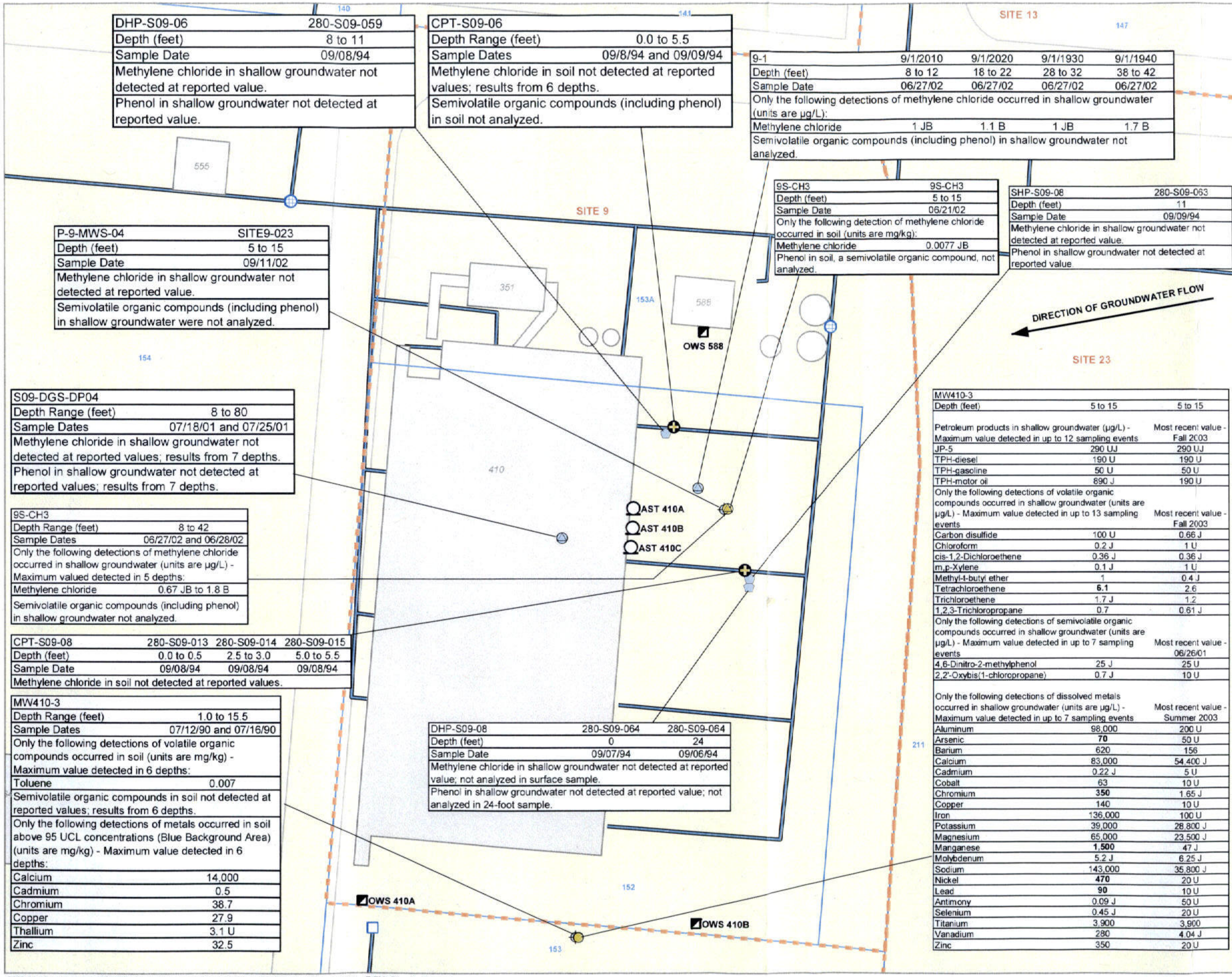


Alameda Point
NAVFACENGCOM Southwest Division, San Diego, CA

FIGURE G3-1
SWMUs Located Within Operable Unit 2A
(Sites 9, 13, 19, 22 and 23)

SWMU Evaluation Report for Operable Unit 2A



DHP-S09-06	280-S09-059
Depth (feet)	8 to 11
Sample Date	09/08/94
Methylene chloride in shallow groundwater not detected at reported value.	
Phenol in shallow groundwater not detected at reported value.	

CPT-S09-06	
Depth Range (feet)	0.0 to 5.5
Sample Dates	09/8/94 and 09/09/94
Methylene chloride in soil not detected at reported values; results from 6 depths.	
Semivolatile organic compounds (including phenol) in soil not analyzed.	

9-1	9/1/2010	9/1/2020	9/1/1930	9/1/1940
Depth (feet)	8 to 12	18 to 22	28 to 32	38 to 42
Sample Date	06/27/02	06/27/02	06/27/02	06/27/02
Only the following detections of methylene chloride occurred in shallow groundwater (units are µg/L):				
Methylene chloride	1 JB	1.1 B	1 JB	1.7 B
Semivolatile organic compounds (including phenol) in shallow groundwater not analyzed.				

9S-CH3	9S-CH3
Depth (feet)	5 to 15
Sample Date	06/21/02
Only the following detection of methylene chloride occurred in soil (units are mg/kg):	
Methylene chloride	0.0077 JB
Phenol in soil, a semivolatile organic compound, not analyzed.	

SHP-S09-08	280-S09-063
Depth (feet)	11
Sample Date	09/09/94
Methylene chloride in shallow groundwater not detected at reported value.	
Phenol in shallow groundwater not detected at reported value.	

P-9-MWS-04	SITE9-023
Depth (feet)	5 to 15
Sample Date	09/11/02
Methylene chloride in shallow groundwater not detected at reported value.	
Semivolatile organic compounds (including phenol) in shallow groundwater were not analyzed.	

S09-DGS-DP04	
Depth Range (feet)	8 to 80
Sample Dates	07/18/01 and 07/25/01
Methylene chloride in shallow groundwater not detected at reported values; results from 7 depths.	
Phenol in shallow groundwater not detected at reported values; results from 7 depths.	

9S-CH3	
Depth Range (feet)	8 to 42
Sample Dates	06/27/02 and 06/28/02
Only the following detections of methylene chloride occurred in shallow groundwater (units are µg/L) - Maximum valued detected in 5 depths:	
Methylene chloride	0.67 JB to 1.8 B
Semivolatile organic compounds (including phenol) in shallow groundwater not analyzed.	

CPT-S09-08	280-S09-013	280-S09-014	280-S09-015
Depth (feet)	0.0 to 0.5	2.5 to 3.0	5.0 to 5.5
Sample Date	09/08/94	09/08/94	09/08/94
Methylene chloride in soil not detected at reported values.			

MW410-3	
Depth Range (feet)	1.0 to 15.5
Sample Dates	07/12/90 and 07/16/90
Only the following detections of volatile organic compounds occurred in soil (units are mg/kg) - Maximum value detected in 6 depths:	
Toluene	0.007
Semivolatile organic compounds in soil not detected at reported values; results from 6 depths.	
Only the following detections of metals occurred in soil above 95 UCL concentrations (Blue Background Area) (units are mg/kg) - Maximum value detected in 6 depths:	
Calcium	14,000
Cadmium	0.5
Chromium	38.7
Copper	27.9
Thallium	3.1 U
Zinc	32.5

DHP-S09-08	280-S09-064	280-S09-064
Depth (feet)	0	24
Sample Date	09/07/94	09/06/94
Methylene chloride in shallow groundwater not detected at reported value; not analyzed in surface sample.		
Phenol in shallow groundwater not detected at reported value; not analyzed in 24-foot sample.		

MW410-3		
Depth (feet)	5 to 15	5 to 15
Petroleum products in shallow groundwater (µg/L) - Maximum value detected in up to 12 sampling events		Most recent value - Fall 2003
JP-5	290 UJ	290 UJ
TPH-diesel	190 U	190 U
TPH-gasoline	50 U	50 U
TPH-motor oil	890 J	190 U
Only the following detections of volatile organic compounds occurred in shallow groundwater (units are µg/L) - Maximum value detected in up to 13 sampling events		Most recent value - Fall 2003
Carbon disulfide	100 U	0.66 J
Chloroform	0.2 J	1 U
cis-1,2-Dichloroethene	0.36 J	0.36 J
m,p-Xylene	0.1 J	1 U
Methyl-t-butyl ether	1	0.4 J
Tetrachloroethene	**6.1**	2.6
Trichloroethene	1.7 J	1.2
1,2,3-Trichloropropane	0.7	0.61 J
Only the following detections of semivolatile organic compounds occurred in shallow groundwater (units are µg/L) - Maximum value detected in up to 7 sampling events		Most recent value - 06/26/01
4,6-Dinitro-2-methylphenol	25 J	25 U
2,2'-Oxybis(1-chloropropane)	0.7 J	10 U
Only the following detections of dissolved metals occurred in shallow groundwater (units are µg/L) - Maximum value detected in up to 7 sampling events		Most recent value - Summer 2003
Aluminum	98,000	200 U
Arsenic	**70**	50 U
Barium	620	156
Calcium	83,000	54,400 J
Cadmium	0.22 J	5 U
Cobalt	63	10 U
Chromium	**350**	1.65 J
Copper	140	10 U
Iron	136,000	100 U
Potassium	39,000	28,800 J
Magnesium	65,000	23,500 J
Manganese	**1,500**	47 J
Molybdenum	5.2 J	6.25 J
Sodium	143,000	35,800 J
Nickel	**470**	20 U
Lead	**90**	10 U
Antimony	0.09 J	50 U
Selenium	0.45 J	20 U
Titanium	3,900	3,900
Vanadium	280	4.04 J
Zinc	350	20 U

GROUNDWATER SAMPLING LOCATION
- Direct-Push
- Hydropunch
- Monitoring Well

SOIL SAMPLING LOCATION
- Direct-Push
- Soil Boring
- Soil Punch

- MANHOLE
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- STORM SEWER LINE
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:

B = Compound detected in an associated blank as well as the sample
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
J = Analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample
MCL = Maximum contaminant level
mg/kg = Milligrams per kilogram
SWMU = Solid Waste Management Unit
TPH = Total petroleum hydrocarbon
U = Analyzed for, but not detected (at reported value)
UCL = Upper confidence limit
µg/L = Micrograms per liter

Bold values indicate "Exceeds primary or secondary MCL"
Only methylene chloride and phenol results are presented for ASTs 410A, 410B, and 410C.

25 0 25 50 Feet

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FIGURE G3-2
CERCLA Site 9
SWMU Soil and Groundwater Sample Results

SWMU Evaluation Report for Operable Unit 2A

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210-IW-001	210I-001	210I-011
Depth (feet)	3.0 to 3.5	3.0 to 3.5
Sample Date	01/05/95	01/05/95
Petroleum products in soil (mg/kg):		
Oil and Grease	1,010	1,060
TPH-diesel	11 U	450 YJ
TPH-gasoline	0.56 U	11 ZJ
TPH-motor oil	200 YJ	22 U
Only the following detections of volatile organic compounds occurred in soil (units are mg/kg):		
Ethylbenzene	0.011 U	0.008 J
Semivolatile organic compounds in soil not detected at reported values.		
Pesticides and herbicides in soil not detected at reported values.		
Only the following detections of PAHs occurred in soil (units are mg/kg):		
Benzo(a)anthracene	0.032 J	1.5 U
Benzo(a)pyrene	0.032 J	1.5 U
Benzo(b)fluoranthene	0.038 J	1.5 U
Chrysene	0.041 J	1.5 U
Fluoranthene	0.060 J	1.5 U
Indeno(1,2,3-cd)pyrene	0.020 J	1.5 U
2-Methylnaphthalene	0.37 U	1 J
Phenanthrene	0.037 J	1.5 U
Pyrene	0.064 J	1.5 U
Only the following detections of metals in soil above 95 UCL concentrations (Blue Background Area) occurred (units are mg/kg):		
Aluminum	7,390 J	9,510 J
Barium	113 J	64.6 J
Beryllium	1.5	2.4
Cadmium	0.11 B	0.11 B
Cobalt	6 B	8.4 B
Copper	20.5	28.1
Iron	10,400 J	17,500 J
Potassium	1,030 B	976 B
Lead	17.5 EJ	15.7 EJ
Magnesium	2,570	3,570
Manganese	158	189
Nickel	27.2	32.8
Thallium	3.1	4.2
Vanadium	26.4	38
Zinc	50.4	61.1

CA13-04	030-CAP-189	030-CAP-374
Depth (feet)	0 to 10	0 to 10
Sample Date	06/15/00	06/15/00
Petroleum products in shallow groundwater (µg/L):		
TPH-diesel	**5,600 J**	**5,800 J**
TPH-gasoline	**760 J**	**6,000 J**
TPH-motor oil	**520**	**520**
Only the following detection of volatile organic compounds occurred in shallow groundwater (units are µg/L):		
Benzene	0.5	0.5
Only the following detection of dissolved metals (only lead analyzed) in shallow groundwater occurred above 95 UCL background concentrations (units are µg/L):		
Lead	3 U	9.5

CA13-26	030-CAP-429
Depth (feet)	3 to 8
Sample Date	06/21/00
Petroleum products in shallow groundwater (µg/L):	
TPH-diesel	**8,900 J**
TPH-gasoline	**8,600 J**
TPH-motor oil	500 U
Volatile organic compounds in shallow groundwater not detected at reported values.	
Metals (only lead analyzed) in shallow groundwater not detected at reported value.	

147-SS-003	147M-003	147M-003M
Depth (feet)	5.5 to 6.5	5.5 to 6.5
Sample Date	05/24/95	05/24/95
Petroleum products in soil (mg/kg):		
Oil and Grease	406	NA
TPH-diesel	NA	**2,000**
TPH-gasoline	NA	**45**
TPH-motor oil	NA	1,500 U
Volatile organic compounds in soil not detected at reported values.		
Only the following detections of semivolatile organic compounds occurred in soil (units are mg/kg):		
Di-n-butylphthalate	0.069 J	NA
Di-n-octylphthalate	0.025 J	NA
Only the following detections of PAHs occurred in soil (units are mg/kg):		
2-Methylnaphthalene	0.043 J	NA
Naphthalene	0.034 J	NA
Pyrene	0.028 J	NA
Only the following detections of metals in soil above 95 UCL concentrations (Blue Background Area) occurred (units are mg/kg):		
Arsenic	NA	7.2
Barium	NA	79.7
Beryllium	NA	0.43
Cadmium	NA	0.54
Cobalt	NA	7.1
Copper	NA	16.8
Lead	NA	23.8
Vanadium	NA	27.3
Zinc	NA	41.5

CA13-26	030-CAP-427	030-CAP-428
Depth (feet)	3.5 to 4.5	6.5 to 7.0
Sample Date	06/21/00	06/21/00
Petroleum products in soil (mg/kg):		
TPH-diesel	280 J	210 J
TPH-gasoline	380 J	**1,100 J**
TPH-motor oil	11 U	22 U
Volatile organic compounds in soil not detected at reported values.		
Metals (only lead analyzed) in soil not detected at reported value.		

SITE 22

210-IW-003	210I-003	210I-003M
Depth (feet)	5.0 to 5.5	5.0 to 5.5
Sample Date	01/05/95	01/05/95
Petroleum products in soil (mg/kg):		
Oil and Grease	5,120	NA
TPH-diesel	960 YJ	NA
TPH-gasoline	320 ZJ	NA
TPH-motor oil	23 U	NA
Only the following detections of volatile organic compounds occurred in soil (units are mg/kg):		
Ethylbenzene	0.002 J	1.9
Xylenes	0.004 J	NA
Only the following detections of semivolatile organic compounds occurred in soil (units are mg/kg):		
Bis(2-ethylhexyl)phthalate	0.099 J	NA
Butylbenzylphthalate	0.24 J	NA
Pesticides and herbicides in soil not detected at reported values.		
Only the following detections of PAHs occurred in soil (units are mg/kg):		
Fluoranthene	0.12 J	NA
Fluorene	0.089 J	NA
Pyrene	0.13 J	NA
Only the following detections of metals in soil above 95 UCL concentrations (Blue Background Area) occurred (units are mg/kg):		
Aluminum	7,450 J	NA
Arsenic	1.4 B	NA
Barium	93.1	NA
Beryllium	1.8	25 U
Cadmium	0.25 B	25 U
Cobalt	7.2 B	NA
Copper	24.8	25 U
Iron	11,400 J	NA
Lead	38 EJ	26
Manganese	185	NA
Nickel	28.6	46
Thallium	3.7	NA
Vanadium	28.9	NA
Zinc	56.7	30

SOIL SAMPLING LOCATION
- Excavation
- Soil Boring
- Vacuum Excavation

GROUNDWATER SAMPLING LOCATION
- Direct-Push
- Monitoring Well
- Piezometer
- SWMUs INTEGRATED WITH THE TPH PROGRAM
- MANHOLE
- CATCH BASIN
- GENERATOR ACCUMULATION POINT (GAP)
- OIL-WATER SEPARATOR (OWS)
- ABOVEGROUND STORAGE TANK (AST), REMOVED
- UNDERGROUND STORAGE TANK (UST), PRESENT
- STORM SEWER LINE
- CERCLA SITE BOUNDARY
- ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
AOC = Area of Concern
B = Value was less than the contract required detection limit (CRDL), but greater than the instrument detection limit (IDL).
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
E = Compound concentration exceeds the gas chromatograph/mass spectrometer (GC/MS) calibration range
J = Analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample
M = Mobile laboratory
mg/kg = Milligrams per kilogram
NA = Not Analyzed
NADEP = Naval Aviation Depot
PAH = Polynuclear aromatic hydrocarbon
PRC = Preliminary Remediation Criteria
RV = Recreational Vehicle
SWMU = Solid Waste Management Unit
TPH = Total petroleum hydrocarbon
U = Analyzed for, but not detected (at reported value)
UCL = Upper confidence limit
µg/L = Micrograms per liter
Y = Hydrocarbon mixture did not exhibit a reasonable pattern match with the calibration standard
Z = Chromatographic response did not resemble a typical fuel pattern
Bold values indicate "Exceeds soil residential PRC or groundwater PRC"

60 0 60 120 Feet

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FIGURE G3-3
CERCLA Site 13
SWMU Soil and Groundwater Sample Results

SWMU Evaluation Report for Operable Unit 2A

2005-01-19 U:\almda_sa\DO033\SWMU_Summary_Report\ou2a\mxd\fig03-03_s13_s_gw.mxd TtEMI-SA K. Johnson

372-MW2	372-MW2
Depth (feet)	3.5
Sample Date	01/20/95
Petroleum products in soil (mg/kg):	
JP-5	NA
TPH-diesel	17
TPH-gasoline	1 U
TPH-motor oil	NA
Volatile organic compounds (BTEX only) in soil not detected at reported values.	

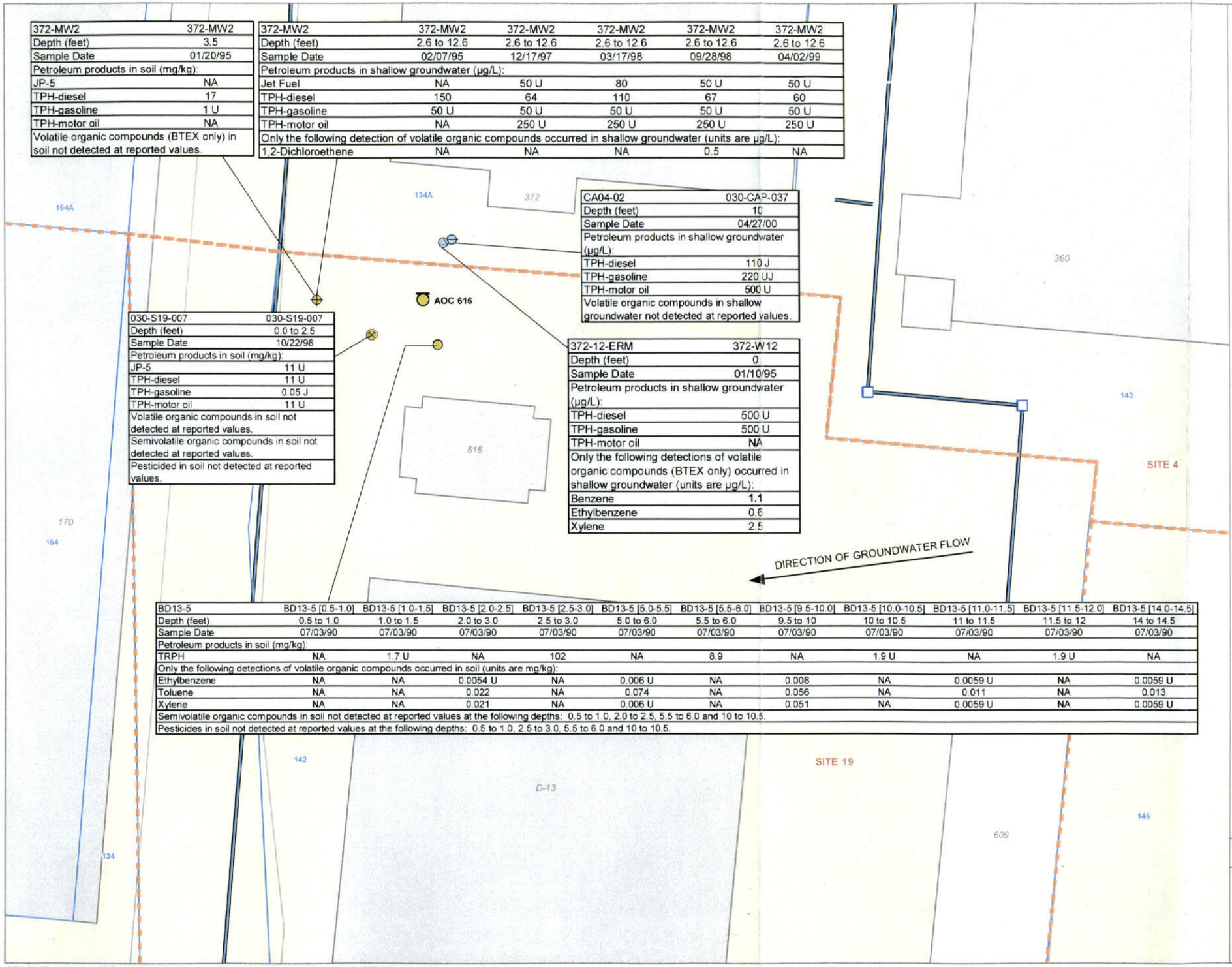
372-MW2	372-MW2	372-MW2	372-MW2	372-MW2	372-MW2
Depth (feet)	2.6 to 12.6	2.6 to 12.6	2.6 to 12.6	2.6 to 12.6	2.6 to 12.6
Sample Date	02/07/95	12/17/97	03/17/98	09/28/98	04/02/99
Petroleum products in shallow groundwater (µg/L):					
Jet Fuel	NA	50 U	80	50 U	50 U
TPH-diesel	150	64	110	67	60
TPH-gasoline	50 U	50 U	50 U	50 U	50 U
TPH-motor oil	NA	250 U	250 U	250 U	250 U
Only the following detection of volatile organic compounds occurred in shallow groundwater (units are µg/L):					
1,2-Dichloroethene	NA	NA	NA	0.5	NA

CA04-02	030-CAP-037
Depth (feet)	10
Sample Date	04/27/00
Petroleum products in shallow groundwater (µg/L):	
TPH-diesel	110 J
TPH-gasoline	220 UJ
TPH-motor oil	500 U
Volatile organic compounds in shallow groundwater not detected at reported values.	

030-S19-007	030-S19-007
Depth (feet)	0.0 to 2.5
Sample Date	10/22/98
Petroleum products in soil (mg/kg):	
JP-5	11 U
TPH-diesel	11 U
TPH-gasoline	0.05 J
TPH-motor oil	11 U
Volatile organic compounds in soil not detected at reported values.	
Semivolatile organic compounds in soil not detected at reported values.	
Pesticided in soil not detected at reported values.	

372-12-ERM	372-W12
Depth (feet)	0
Sample Date	01/10/95
Petroleum products in shallow groundwater (µg/L):	
TPH-diesel	500 U
TPH-gasoline	500 U
TPH-motor oil	NA
Only the following detections of volatile organic compounds (BTEX only) occurred in shallow groundwater (units are µg/L):	
Benzene	1.1
Ethylbenzene	0.6
Xylene	2.5

BD13-5	BD13-5 [0.5-1.0]	BD13-5 [1.0-1.5]	BD13-5 [2.0-2.5]	BD13-5 [2.5-3.0]	BD13-5 [5.0-5.5]	BD13-5 [5.5-6.0]	BD13-5 [9.5-10.0]	BD13-5 [10.0-10.5]	BD13-5 [11.0-11.5]	BD13-5 [11.5-12.0]	BD13-5 [14.0-14.5]
Depth (feet)	0.5 to 1.0	1.0 to 1.5	2.0 to 3.0	2.5 to 3.0	5.0 to 6.0	5.5 to 6.0	9.5 to 10	10 to 10.5	11 to 11.5	11.5 to 12	14 to 14.5
Sample Date	07/03/90	07/03/90	07/03/90	07/03/90	07/03/90	07/03/90	07/03/90	07/03/90	07/03/90	07/03/90	07/03/90
Petroleum products in soil (mg/kg):											
TRPH	NA	1.7 U	NA	102	NA	8.9	NA	1.9 U	NA	1.9 U	NA
Only the following detections of volatile organic compounds occurred in soil (units are mg/kg):											
Ethylbenzene	NA	NA	0.0054 U	NA	0.006 U	NA	0.008	NA	0.0059 U	NA	0.0059 U
Toluene	NA	NA	0.022	NA	0.074	NA	0.056	NA	0.011	NA	0.013
Xylene	NA	NA	0.021	NA	0.006 U	NA	0.051	NA	0.0059 U	NA	0.0059 U
Semivolatile organic compounds in soil not detected at reported values at the following depths: 0.5 to 1.0, 2.0 to 2.5, 5.5 to 6.0 and 10 to 10.5.											
Pesticides in soil not detected at reported values at the following depths: 0.5 to 1.0, 2.5 to 3.0, 5.5 to 6.0 and 10 to 10.5.											



GROUNDWATER SAMPLING LOCATION
- Direct-Push
- Monitoring Well
- Piezometer

SOIL SAMPLING LOCATION
- Excavation
- Monitoring Well
- Soil Boring
- UNDERGROUND STORAGE TANK (UST), PRESENT
- CATCH BASIN
- STORM SEWER LINE
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:

AOC = Area of concern
BTEX = Benzene, toluene, ethylbenzene, and xylene
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
J = Analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample
MCL = Maximum contaminant level
mg/kg = Milligrams per kilogram
NA = Not Analyzed
SWMU = Solid Waste Management Unit
TPH = Total petroleum hydrocarbon
TRPH = Total recoverable petroleum hydrocarbons
U = Analyzed for, but not detected (at reported value)
µg/L = Micrograms per liter

Bold value indicates "Exceeds MCL"

20 0 20 40 Feet

N

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FIGURE G3-4
CERCLA Site 19
AOC 616 Soil and Groundwater Sample Results

SWMU Evaluation Report for Operable Unit 2A

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DHP-S10B-05	280-S10B-115
Depth (feet)	21
Sample Date	07/15/94
Petroleum products in shallow groundwater (µg/L):	
JP-5	100 U
TPH-diesel	100 UJ
TPH-gasoline	50 U
TPH-motor oil	500 U
Volatile organic compounds in shallow groundwater not detected at reported values.	
Only the following detection of semivolatile organic compounds occurred in shallow groundwater (units are µg/L):	
Phenol	0.5 J
PAHs in shallow groundwater not detected at reported values.	
Only the following detections of dissolved metals in shallow groundwater occurred above 95 UCL background concentrations (units are µg/L):	
Iron	**6,840 J**
Manganese	**4,810**

SHP-S10B-05	280-S10B-127
Depth (feet)	5.0 to 8.5
Sample Date	08/22/94
Petroleum products in shallow groundwater (µg/L):	
JP-5	100 U
TPH-diesel	100 U
TPH-gasoline	**460 J**
TPH-motor oil	**3,620 J**
Only the following detection of volatile organic compounds occurred in shallow groundwater (units are µg/L):	
2-Butanone	4,200 J
Only the following detection of semivolatile organic compounds occurred in shallow groundwater (units are µg/L):	
2,4-Dichlorophenol	0.5 J
Only the following detection of semivolatile organic compounds occurred in shallow groundwater (units are µg/L):	
Benzo(a)pyrene	0.6 J
Benzo(b)fluoranthene	0.8 J
Chrysene	0.9 J
Fluoranthene	1 J
Pyrene	1 J
Only the following detections of dissolved metals in shallow groundwater occurred above 95 UCL background concentrations (units are µg/L):	
Arsenic	15.2
Barium	222
Copper	13.7 J

211-IWCO-001	211C-001	211C-001M
Depth (feet)	1.0 to 2.0	1.0 to 2.0
Sample Date	01/20/95	01/20/95
Petroleum products in soil (mg/kg):		
Oil and Grease	5,980 J	NA
TPH-diesel	**9,060 YJ**	NA
TPH-gasoline	**1,180 ZJ**	NA
TPH-motor oil	220 U	NA
Only the following detections of volatile organic compounds occurred in soil (units are mg/kg):		
Acetone	0.038 J	NA
Ethylbenzene	0.19	1.5
m,p-Xylene	NA	0.8
Toluene	0.017 J	4 U
Xylene	0.12	NA
Semivolatile organic compounds in soil not detected at reported values; not analyzed in 211C-001M.		
Pesticides and herbicides in soil not detected at reported values.		
Only the following detections of PAHs occurred in soil (units are mg/kg):		
2-Methylnaphthalene	11	NA
Naphthalene	6.4	NA
Phenanthrene	0.25 J	NA
Only the following detections of metals in soil above 95 UCL concentrations (Blue Background Area) occurred (units are mg/kg):		
Antimony	0.82 BNJ	25 U
Barium	58.6	NA
Copper	6	25 U
Lead	20.5	25 U
Nickel	18	77
Zinc	30.1 EJ	43

148-001-004	148-0005M	148-0006
Depth (feet)	3.5 to 4.0	3.5 to 4.0
Sample Date	02/07/95	02/07/95
Petroleum products in soil (mg/kg):		
TPH-diesel	50 U	NA
TPH-gasoline	50 U	NA
Only the following detections of metals occurred in soil (units are mg/kg):		
Nickel	41	NA
Zinc	25	NA
Volatile organic compounds in soil not detected at reported values.		
Semivolatile organic compounds in soil not detected at reported values; not analyzed in 148-0005M.		
Polyaromatic hydrocarbons in soil not detected at reported values; not analyzed in 148-0005M.		

SOIL SAMPLING LOCATION
- Direct-Push
- Soil Boring
- Surface Location

GROUNDWATER SAMPLING LOCATION
- Hydropunch
- SWMUs INTEGRATED WITH THE TPH PROGRAM
- GENERATOR ACCUMULATION POINT (GAP)
- MANHOLE
- CATCH BASIN
- OIL-WATER SEPARATOR (OWS)
- STORM SEWER LINE
- CERCLA SITE BOUNDARY
- # ENVIRONMENTAL BASELINE SURVEY (EBS) PARCEL AND NUMBER
- LAND COVER

BUILDING
- Present
- Removed

Notes:
AST = Aboveground storage tank
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
J = Analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample
M = Mobile laboratory
MCL = Maximum contaminant level
mg/kg = Milligrams per kilogram
NA = Not Analyzed
NADEP = Naval Aviation Depot
PAH = Polynuclear aromatic hydrocarbon
PRC = Preliminary Remediation Criteria
SWMU = Solid Waste Management Unit
TPH = Total petroleum hydrocarbons
U = Analyzed for, but not detected (at reported value)
UCL = Upper confidence limit
µg/L = Micrograms per liter
Y = Hydrocarbon mixture did not exhibit a reasonable pattern match with the calibration standard
Z = Chromatographic response did not resemble a typical fuel pattern

Bold values indicate "Exceeds soil residential or non-residential PRC, groundwater PRC, or secondary MCL"

50 0 50 100 Feet

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FIGURE G3-5
CERCLA Site 23
SWMU Soil and Groundwater Sample Results

SWMU Evaluation Report for Operable Unit 2A

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TABLES

TABLE G2-1: SOLID WASTE MANAGEMENT UNITS INTEGRATED WITH THE CERCLA PROGRAM IN OPERABLE UNIT 2A (SITES 9, 13, 19, 22, AND 23) AT ALAMEDA POINT

Solid Waste Management Unit Evaluation Report for Operable Unit 2A

CERCLA Site	Identification	Navy Recommendation/ Closure Status	Refer to Figure for Sample Results
9	AST 410A	NFA Recommended	Figure G3-2
9	AST 410B	NFA Recommended	Figure G3-2
9	AST 410C	NFA Recommended	NA
9	OWS 410A	Further Action Recommended	Figure G3-2
9	OWS 410B	Further Action Recommended	Figure G3-2
9	OWS 588	Closed by DTSC	NA
13	AOC 009	Further Action Recommended	Figure G3-3
13	NADEP GAP 62	NFA Recommended	NA
19	AOC 616	NFA Recommended	Figure G3-4
22	OWS 547	Further Action Recommended	NA
23	NADEP GAP 63	NFA Recommended	Figure G3-5
23	NADEP GAP 63A	NFA Recommended	NA
23	NADEP GAP 64	NFA Recommended	NA

Notes:

AOC	Area of concern
AST	Aboveground storage tank
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
GAP	Generation accumulation point
NA	Not applicable
NADEP	Naval Aviation Depot
NAS	Naval Air Station
NFA	No further action
OWS	Oil-water separator
(R)	RCRA
RCRA	Resource Conservation and Recovery Act
SWMU	Solid waste management unit
UST	Underground Storage Tank
WD	Washdown

TABLE G2-2: SOLID WASTE MANAGEMENT UNITS RECOMMENDED FOR INTEGRATION WITH THE TOTAL PETROLEUM HYDROCARBON PROGRAM IN OPERABLE UNIT 2A (SITES 9, 13, 19, 22, AND 23) AT ALAMEDA POINT

Solid Waste Management Unit Evaluation Report for Operable Unit 2A

CERCLA Site	Identification	Material Stored/Disposed	Navy Recommendation/ Closure Status	Refer to Figure for Sample Results
13	AOC 397	Jet fuel from spill	Further Action Recommended	Figure G3-3
13	OWS 397A	Dirty water sump	Further Action Recommended	Figure G3-3
13	OWS 397B	Dirty water sump	Further Action Recommended	Figure G3-3
13	OWS 397C	Dirty water sump	Further Action Recommended	Figure G3-3
13	OWS 397D	Dirty water sump	Further Action Recommended	Figure G3-3
22	UST(R)-17	Gasoline	NFA Recommended	NA
23	AST 530A	1010 oil	Further Action Recommended	Figure G3-5
23	AST 530B	Fuel or oil	Further Action Recommended	Figure G3-5
23	AST 530C	Jet fuel	Further Action Recommended	Figure G3-5
23	OWS 529	Unknown	Further Action Recommended	Figure G3-5
23	OWS 530	Unknown	Further Action Recommended	Figure G3-5

Notes:

AOC	Area of concern
AST	Aboveground storage tank
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
GAP	Generation accumulation point
NA	Not applicable
NAS	Naval Air Station
NFA	No further action
OWS	Oil-water separator
(R)	RCRA
RCRA	Resource Conservation and Recovery Act
RWQCB	Regional Water Quality Control Board
SWMU	Solid waste management unit
UST	Underground Storage Tank

Table G3-1: PROFILES FOR SOLID WASTE MANAGEMENT UNITS IN SITES 9, 13, 19, 22, AND 23 INTEGRATED WITH CERCLA PROGRAM

Solid Waste Management Unit Evaluation Report for Operable Unit 2A
Listed in CERCLA Site Order

SWMU Identifier **AST 410A** **Refer to Figure #** Figure G3-2

Navy Recommendation/Closure Status **NFA Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 9

EBS Subparcel 152 **TPH CAA** NA

Associated Building 410 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Aircraft Stripping Facility/Corrosion Control

Additional Information East of Building 410; approximate location shown on figure

Operational Information for SWMU

Type of Unit Aboveground Storage Tank(s)

Capacity (gallons) 10,000

Period of Operation Unknown

Material Managed at SWMU Methylene chloride

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources EBS (IT 2001)

Tank-Related Information

Status of Tank Removed **Status of Associated Pipes** Removed

Data Analysis

AST 410A is one of three ASTs located on the eastern side of Building 410. The 10,000-gallon AST held methylene chloride, which was used inside Building 410, an aircraft stripping facility. The EBS stated that open space around the building was covered by concrete. Stains on the concrete suggested that undocumented spills (believed to be aircraft fuel) might have occurred in the open space; no documented incidents exist (IT 2001). As depicted on the figure for Site 9, multiple groundwater samples were collected in the vicinity (50 foot radius) at depths ranging from 8 to 80 feet bgs; methylene chloride was not detected or detected at concentrations below 2 ug/L, which is below the MCL (California Department of Health Services 2003). All detected concentrations were qualified with a "B" indicating that methylene chloride was also detected in an associated laboratory blank. Multiple soil samples were also collected at depths ranging from the surface to 15 feet bgs. Methylene chloride was only detected in one soil sample at 0.0077 mg/kg. Like the detected groundwater results, this result was qualified with a "B". Methylene chloride is a common laboratory contaminant. Given these facts, it does not appear that the AST 410A was a source of release(s) to soil or groundwater. NFA is recommended for AST 410A.

Nondetect Review

Nondetect values were compared to 2004 Region 9 residential PRGs and Cal-modified PRGs, when available; groundwater nondetect values were also compared to California MCLs. All nondetect values for methylene chloride in soil less than PRG. All nondetect values for methylene chloride in groundwater less than PRG; MCL not available. Nondetect values were found to not be a problem as the AST contained methylene chloride.

2002 Site Visit

AST removed prior to 2002 site visit.

SWMU Identifier **AST 410B** **Refer to Figure #** Figure G3-2

Navy Recommendation/Closure Status **NFA Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 9

EBS Subparcel 152 **TPH CAA** NA

Associated Building 410 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Aircraft Stripping Facility/Corrosion Control

Additional Information East of Building 410; approximate location shown on figure

Operational Information for SWMU

Type of Unit Aboveground Storage Tank(s)

Capacity (gallons) 10,000

Period of Operation Unknown

Material Managed at SWMU Phenol

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources EBS (IT 2001)

Tank-Related Information

Status of Tank Removed **Status of Associated Pipes** Removed

Data Analysis

AST 410B is one of three ASTs located on the eastern side of Building 410. The 10,000-gallon AST held phenol, which was used inside Building 410, an aircraft stripping facility. The EBS stated that open space around the building was covered by concrete. Stains on the concrete suggested that undocumented spills (believed to be aircraft fuel) might have occurred in the open space; no documented incidents exist (IT 2001). As depicted of the figure for Site 9, no nearby soil samples were analyzed for phenol; however, multiple groundwater samples were collected in the vicinity (65 foot radius) at depths ranging from the surface to 80 feet bgs. Phenol was not detected in groundwater. Given these facts, it does not appear that the AST 410B was a source of release(s) to soil or groundwater. NFA is recommended for AST 410B.

Nondetect Review

Nondetect values were compared to 2004 Region 9 residential PRGs and Cal-modified PRGs, when available; groundwater nondetect values were also compared to California MCLs. Analyses for phenol, a semivolatile organic compound, were not conducted on available soil samples. All nondetect values for phenol in groundwater less than PRG; MCL not available. Nondetect values were found to not be a problem as the AST contained phenol.

2002 Site Visit

AST removed prior to 2002 site visit.

SWMU Identifier **AST 410C** **Refer to Figure #** NA

Navy Recommendation/Closure Status **NFA Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 9

EBS Subparcel 152 **TPH CAA** NA

Associated Building 410 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Aircraft Stripping Facility/Corrosion Control

Additional Information East of Building 410; approximate location shown on figure

Operational Information for SWMU

Type of Unit Aboveground Storage Tank(s)

Capacity (gallons) 1,500

Period of Operation Unknown

Material Managed at SWMU Surfactant

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources EBS (IT 2001)

Tank-Related Information

Status of Tank Removed **Status of Associated Pipes** Removed

Data Analysis

AST 410C is one of three former ASTs located on the eastern side of Building 410. The 1,500-gallon AST held surfactant, which was used inside Building 410, an aircraft stripping facility. The EBS indicated that open space around the building was covered by concrete. Stains on the concrete suggested that undocumented spills (believed to be aircraft fuel) may have occurred in the open space; no documented incidents exist (IT 2001). The former tank content (surfactant) does not meet the definition of a hazardous material, hazardous waste, or petroleum product. Based on these facts NFA is recommended for AST 410C.

Nondetect Review

NA

2002 Site Visit

AST removed prior to 2002 site visit.

SWMU Identifier **OWS 410A** **Refer to Figure #** Figure G3-2

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 9

EBS Subparcel 152 **TPH CAA** NA

Associated Building 410 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Aircraft Stripping Facility/Corrosion Control

Additional Information Southwestern corner of Building 410; west of washrack area along southern edge of building; best-known location shown on figure

Operational Information for SWMU

Type of Unit Oil-Water Separator

Capacity (gallons) 4.5 ft x 7 ft (depth unknown)

Period of Operation Unknown

Material Managed at SWMU Rinsewater from washrack

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources Final FSP for Data Gap Sampling (Tetra Tech 2001)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

OWS-410A is located within CERCLA Site 9, south of Building 410. The inactive OWS is located adjacent to an inactive, partially enclosed wash rack. During a July 2004 site visit, a drain was observed in the wash rack; it appeared at one time, to have been connected to the subject OWS. The general groundwater flow for this area is southwest. No sampling has been conducted near the OWS. Further action is recommended for OWS-410A. Soil and groundwater at Site 9 are recommended for further evaluation in an FS, as defined under CERCLA, to address risks to residential receptors under the unrestricted reuse scenario.

Nondetect Review

NA

2002 Site Visit

OWS was observed during the 2002 site visit; it was inactive; July 2004 visit: OWS contained water.

Table G3-1: PROFILES FOR SOLID WASTE MANAGEMENT UNITS IN SITES 9, 13, 19, 22, AND 23 INTEGRATED WITH CERCLA PROGRAM

SWMU Identifier **OWS 410B** **Refer to Figure #** Figure G3-2

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 9

EBS Subparcel 152 **TPH CAA** NA

Associated Building 410 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Aircraft Stripping Facility/Corrosion Control

Additional Information Southeastern corner of Building 410; collects water from drains in concrete around building; best-known location shown on figure

Operational Information for SWMU

Type of Unit Oil-Water Separator

Capacity (gallons) 6 ft x 10 ft (depth unknown)

Period of Operation Unknown

Material Managed at SWMU Stormwater runoff

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources Final FSP for Data Gap Sampling (Tetra Tech 2001)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

OWS-410B is located within CERCLA Site 9, southeast of Building 410. The inactive OWS collected storm water runoff from the concrete open space on the east side of Building 410. The EBS stated that open space around the building was covered by concrete. Stains on the concrete suggested that undocumented spills (believed to be aircraft fuel) might have occurred in the open space; no documented incidents exist (IT 2001). The general groundwater flow for this area is southwest. Monitoring well MW410-3 is the nearest downgradient well, approximately 60 feet away. Well boring soil samples were analyzed for metals, VOCs, SVOCs, and PAHs. Although analyzed, PAHs in soil were not evaluated in this assessment. As depicted on the figure for Site 9, no analytes exceeded residential PRGs (EPA 2002). Only those metals that exceeded the 95 UCL concentration (Blue Background Area) are shown. Up to 13 sampling events have occurred since the well was constructed; results for TPH, metals (total and dissolved), VOCs, SVOCs, and PAH are available. Although analyzed, PAHs in shallow groundwater were not evaluated in this assessment. Historically, tetrachloroethene was detected in groundwater above the MCL (California Department of Health 2003); however, it was below the MCL in the most recent event. Selected metals (arsenic, chromium, manganese, nickel, and lead) were also historically detected in groundwater at concentrations above primary and secondary MCLs; however, no exceedances occurred in the most recent sampling event. Storm and sanitary sewers around Building 410 are believed to be the source of a chlorinated hydrocarbon groundwater plume in the area. The highest concentrations of VOCs in groundwater were detected adjacent to the sewer systems east of Building 410. Groundwater contamination has migrated towards the west from these sewers. No soil sampling has been conducted immediately adjacent to the OWS; therefore, further action is recommended for OWS 410B. Soil and groundwater at Site 9 are recommended for further evaluation in an FS, as defined under CERCLA, to address risks to residential receptors under the unrestricted reuse scenario.

Nondetect Review

NA

2002 Site Visit

OWS was observed during the 2002 site visit; it was inactive; July 2004 visit: OWS contained water.

SWMU Identifier **OWS 588** **Refer to Figure #** NA

Navy Recommendation/Closure Status **Closed by DTSC**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 9

EBS Subparcel 153A **TPH CAA** NA

Associated Building 588 **Building Status** Removed **Leasing Status** NA

Building Name Industrial Waste Treatment Plant (IWTP 410)

Additional Information South of Building 588; associated with IWTP 410

Operational Information for SWMU

Type of Unit Oil-Water Separator

Capacity (gallons) Unknown

Period of Operation Unknown

Material Managed at SWMU Unknown

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources CERFA EBS (ERM-West 1994)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

OWS-588 is associated with IWTP 410, a regulated RCRA unit. IWTP 410 received closure from DTSC on November 9, 1998.

Nondetect Review

NA

2002 Site Visit

OWS was observed during the 2002 site visit; it was inactive.

SWMU Identifier **AOC 009** **Refer to Figure #** Figure G3-3

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 13

EBS Subparcel 147 **TPH CAA** TPH CAA-13

Associated Building NA **Building Status** NA **Leasing Status** NA

Building Name NA

Additional Information ASTs - 324, 325, 326, 327, 328 on concrete foundations; ASTs removed; coincident with former location of Pacific Coast Oil Works Company Refinery; general location shown on figure

Operational Information for SWMU

Type of Unit Aboveground Storage Tanks(s)

Capacity (gallons) Unknown

Period of Operation Unknown

Material Managed at SWMU Petroleum Hydrocarbon (Fuel)

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources EBS (IT 2001)

Tank-Related Information

Status of Tank Removed **Status of Associated Pipes** Aboveground piping removed.

Data Analysis

AOC 009 consists of former ASTs 324 through 328 installed in 1947 on the eastern portion of Site 13. ASTs 324 through 328 were steel fuel storage tanks atop concrete foundations. The tanks were demolished before May 1990 (IT 2001). The specific capacities and contents of the tanks are unknown. During the late 1940s and 1950s, open space in this area was used for aircraft storage, and these tanks likely contained fuels to support aircraft operation and maintenance. No documented release(s) is known to have occurred from these tanks. Between 1879 and 1903, the former Pacific Coast Oil Works Company Refinery operated at the current location of Site 13 and possible portions of adjoining CERCLA Sites 19, 22, and 23. Historically, groundwater from Monitoring Well M13-07, located southeast of AST 328, contained the maximum concentrations of naphthalene (a component of petroleum-based fuels) and 2-methylnaphthalene (a component of crude oil). BTEX compounds and trimethylbenzenes are associated with areas of known refinery waste contamination. Further action is recommended for AOC 009. Petroleum-related compounds are commingled with CERCLA compounds associated with tarry refinery waste. Soil and groundwater at Site 13 are recommended to be evaluated further in an FS, as defined under CERCLA.

Nondetect Review

NA

2002 Site Visit

AST removed prior to 2002 site visit.

Table G3-1: PROFILES FOR SOLID WASTE MANAGEMENT UNITS IN SITES 9, 13, 19, 22, AND 23 INTEGRATED WITH CERCLA PROGRAM

SWMU Identifier **AOC 397** **Refer to Figure #** Figure G3-3

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 13

EBS Subparcel 147 **TPH CAA** TPH CAA-13

Associated Building 397 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Engine Testing Cells and Aircraft Overhaul Plant Services Facility

Additional Information Building 397; 4,000- to 17,000-gallon spill to soil of fuel/oil/water mixture (part of CAA 13); general location shown on figure

Operational Information for SWMU

Type of Unit Fuel Spill

Capacity (gallons) RCRA corrective action site

Period of Operation Unknown

Material Managed at SWMU Jet fuel from spill

Source of Initial SWMU Identification

SWMU # in RFA AOC **Recommendation in RFA** RFI Required

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources NA

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

The goal of this evaluation is to verify that no CERCLA contaminants were detected and that integration with the TPH Program is appropriate. According to the EBS, Zone 22, Parcel 147, evaluation data summary report (IT 2001), AOC 397 consisted of a 4,000 to 17,000 gallon jet fuel/oil/water spill which occurred along the eastern side of Building 397. AOC 397 encompasses the spill area. Immediate cleanup involved pumping floating free product from the groundwater. Further cleanup involved skimming the fuel/oil/water mixture from the sewer and transferring the material to an oil/water separator. Finally, soil removal has been performed, a dual phase soil vapor and groundwater extraction system was installed in 2002, and remediation of soil and groundwater is underway. TPH contamination at this site is currently being addressed as part of the base-wide TPH Corrective Action Plan under CAA 13. Multiple sampling locations are shown on the figure for CERCLA Site 13; however, hit boxes are only provided for those locations in close proximity to an OWS. Sampling results from all locations were assessed in this evaluation. VOCs in soil and groundwater are consistent with fuel-related, petroleum-based contamination and primarily include BTEX compounds. Other VOCs sporadically detected in soil and groundwater include potential laboratory contaminants (i.e., acetone, 2-butanone, tert-butanol, and carbon disulfide). No SVOCs or PCBs were detected in groundwater; various laboratory-related phthalates (i.e., bis(2-ethylhexyl)phthalate, butylbenzylphthalate, di-n-butylphthalate, and di-n-octylphthalate) and NDMA (in one 1990 sample; compound detected in associated blank) were detected in soil at low concentrations. Low concentrations of pesticides were detected in soil (DDE and DDT less than 0.017 mg/kg at 7.5 feet bgs) and groundwater (DDT at 0.08 ug/l in the first event) at one location (MWOR-1). The pesticide data are from 1990; pesticides have not been detected in more recent sampling in the vincity. Several PAHs, some fuel related (2-methylnaphthalene and naphthalene), were also detected in soil and groundwater at low estimated concentrations; soil concentrations were well below residential PRGs (EPA 2002). Detected metals concentrations exceeding 95 UCL concentrations (Blue Background Area) were also less than residential PRGs. Selected dissolved metals concentrations in groundwater exceeded 95 UCL concentrations; with the exception of a 1990 sample, none of the metals exceeded MCLs (California Department of Health 2003). Considering the past activities, the significant spill, and the type of contamination present, integration with the TPH Program is recommended.

Nondetect Review

NA

2002 Site Visit

NA

SWMU Identifier **NADEP GAP 62** **Refer to Figure #** NA

Navy Recommendation/Closure Status **NFA Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 13

EBS Subparcel 147 **TPH CAA** NA

Associated Building 397 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Engine Testing Cells and Aircraft Overhaul Plant Services Facility

Additional Information Building 397 (inside), Shop 96231; approximate location shown on figure

Operational Information for SWMU

Type of Unit	Generator Accumulation Point
Capacity (gallons)	55-gallon & 30-gallon drums
Period of Operation	GAPs were formally identified in 1987 and continued to operate until base closure and building cleanup was initiated in 1997. Actual startup dates are unknown.
Material Managed at SWMU	Mil-L-23699 lubrication and engine oil

Source of Initial SWMU Identification

SWMU # in RFA GI-45 **Recommendation in RFA** RFI Not Required

Recommended for NFA from DTSC in 1999 Yes

SWMU Identified in Other Sources CERFA EBS (ERM-West 1994)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

NADEP GAP 62 consisted of 30- and 55-gallon storage drums resting on wooden pallets (to allow a forklift to move the drums), some atop a poly spill pallet, which acted as a secondary containment system. The area measured approximately 4 feet by 8 feet and was located inside Building 397 in Shop 96231. According to the RFA, NADEP GAP 62 exhibited a low potential for releases into soil and groundwater because the site was located indoors on a concrete floor (DTSC 1992). An RFI was not required (DTSC 1992). The Phase I EBS concluded that NADEP GAP 62 did not require further investigation because the site was paved and site inspectors did not observe staining (ERM-West 1994). A letter from DTSC dated November 4, 1999, recommended NFA for this SWMU (DTSC 1999). A description of NADEP GAP 62 was included in the EBS, Zone 22, Parcel 147 evaluation data summary report (IT 2001). NADEP GAP 62 was not considered a likely source of soil and groundwater contamination at Site 13 in the OU-2A RI report (Tetra Tech 2005). NFA is recommended for NADEP GAP 62.

Nondetect Review

NA

2002 Site Visit

NA

SWMU Identifier **OWS 397A** **Refer to Figure #** Figure G3-3

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 13

EBS Subparcel 147 **TPH CAA** TPH CAA-13

Associated Building 397 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Engine Testing Cells and Aircraft Overhaul Plant Services Facility

Additional Information Eastern end of Building 397 (1 of 2 aboveground OWSs); approximate location shown on figure

Operational Information for SWMU

Type of Unit Oil-Water Separator

Capacity (gallons) 6,000

Period of Operation Unknown

Material Managed at SWMU Dirty water sump

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources TPH Data Gap Sampling Report (Tetra Tech 2001)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

The goal of this evaluation is to verify that no CERCLA contaminants were detected and that integration with the TPH Program is appropriate. OWS-397A is located within CAA 13 and is approximately 60 feet south of several former fuel lines. The OWS, 1 of 4, was installed near the eastern end of Building 397 to serve as a means of recycling oil from the waste stream before process water or stormwater was discharged to the storm drains. In 1991, a large spill (4,000 to 17,000 gallons of JP-5) was released from Building 397. Floor drains in the building were connected to OWSs. The spill caused associated OWSs to overflow. Refer to AOC 397 for cleanup activities. OWS 397A was filled with a cement slurry and closed in place in 1993 (Navy 1993) and is not a continuing potential source. Soil sample CA13-26, located approximately 25 feet west of the OWS, contains concentrations of gasoline above the residential PRC (Navy 2001). A grab groundwater sample from the location indicated concentrations of total TPH above the PRC for aquatic receptors. VOCs were not detected in soil or groundwater. Metals (only lead analyzed) in soil and groundwater were not detected above 95 UCL concentrations. This site is being evaluated under CAA 13 as part of the TPH program. Considering the past activities, the significant spill, and the type of contamination present, integration with the TPH Program is recommended.

Nondetect Review

NA

2002 Site Visit

OWS was observed during the 2002 site visit; it was inactive.

Table G3-1: PROFILES FOR SOLID WASTE MANAGEMENT UNITS IN SITES 9, 13, 19, 22, AND 23 INTEGRATED WITH CERCLA PROGRAM

SWMU Identifier **OWS 397B** **Refer to Figure #** Figure G3-3

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 13

EBS Subparcel 147 **TPH CAA** TPH CAA-13

Associated Building 397 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Engine Testing Cells and Aircraft Overhaul Plant Services Facility

Additional Information Eastern end of Building 397 (2 of 2 aboveground OWSs); approximate location shown on figure

Operational Information for SWMU

Type of Unit Oil-Water Separator

Capacity (gallons) 6,000

Period of Operation Unknown

Material Managed at SWMU Dirty water sump

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources TPH Data Gap Sampling Report (Tetra Tech 2001)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

The goal of this evaluation is to verify that no CERCLA contaminants were detected and that integration with the TPH Program is appropriate. OWS-397B is located within CAA 13 and is directly above a fuel line. The OWS, 1 of 4, was installed near the eastern end of Building 397 to serve as a means of recycling oil from the waste stream before process water or stormwater was discharged to the storm drains. In 1991, a large spill (4,000 to 17,000 gallons of JP-5) was released from Building 397. Floor drains in the building were connected to OWSs. The spill caused associated OWSs to overflow. Refer to AOC 397 for cleanup activities. OWS 397B was filled with a cement slurry and closed in place in 1993 (Navy 1993) and is not a continuing potential source. Groundwater sample CA13-04, located approximately 15 feet southwest of the OWS, contains TPH concentrations that exceed the total TPH PRC for aquatic receptors (Navy 2001). VOCs (Benzene) in groundwater are consistent with fuel-related, petroleum-based contamination. Metals (lead) in groundwater were detected above the 95 UCL concentration but below the MCL (California Department of Health Services 2003). This site is being evaluated under CAA 13 as part of the TPH program. Considering the past activities, the significant spill, and the type of contamination present, integration with the TPH Program is recommended.

Nondetect Review

NA

2002 Site Visit

OWS was observed during the 2002 site visit; it was inactive.

SWMU Identifier **OWS 397C** **Refer to Figure #** Figure G3-3

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 13

EBS Subparcel 147 **TPH CAA** TPH CAA-13

Associated Building 397 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Engine Testing Cells and Aircraft Overhaul Plant Services Facility

Additional Information Northeastern corner of Building 397; approximate location shown on figure

Operational Information for SWMU

Type of Unit Oil-Water Separator

Capacity (gallons) Unknown

Period of Operation Unknown

Material Managed at SWMU Dirty water sump

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources Removal Action at Bldg 397 JP-5 Release (IT 1993)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

The goal of this evaluation is to verify that no CERCLA contaminants were detected and that integration with the TPH Program is appropriate. OWS-397C is located within CAA 13 and is surrounded by fuel lines on three sides. The OWS, 1 of 4, was installed near the eastern end of Building 397 to serve as a means of recycling oil from the waste stream before process water or stormwater was discharged to the storm drains. In 1991, a large spill (4,000 to 17,000 gallons of JP-5) was released from Building 397. Floor drains in the building were connected to OWSs. The spill caused associated OWSs to overflow. Refer to AOC 397 for cleanup activities. OWS 397C was filled with a cement slurry and closed in place in 1993 (Navy 1993) and is not a continuing potential source. Soil sample 147-SS-003, located approximately 45 feet east of the OWS, contains TPH-diesel at a concentration above the residential PRC (Navy 2001); however, TPH-diesel is below the residential PRC in the adjacent soil sample 210-IW-003. Soil sample 210-IW-001, located approximately 45 feet west of the OWS, contains oil/grease at concentrations up to 1,060 mg/kg. VOCs detected in soil are consistent with fuel-related, petroleum-based contamination (i.e., BTEX). SVOCs are common laboratory contaminants (bis(2-ethylhexyl)phthalate, butylbenzylphthalate, di-n-butylphthalate, and di-n-octylphthalate). Pesticides and herbicides were not detected in soil. Several PAHs, some fuel related (2-methylnaphthalene and naphthalene), were also detected in soil at low estimated concentrations, well below residential PRGs (EPA 2002). Detected metals concentrations exceeding 95 UCL concentrations (Blue Background Area) were also less than residential PRGs. This site is being evaluated under CAA 13 as part of the TPH program. Considering the past activities, the significant spill, and the type of contamination present, integration with the TPH Program is recommended.

Nondetect Review

NA

2002 Site Visit

OWS was observed during the 2002 site visit; it was inactive.

SWMU Identifier **OWS 397D** **Refer to Figure #** Figure G3-3

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 13

EBS Subparcel 147 **TPH CAA** TPH CAA-13

Associated Building 397 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Engine Testing Cells and Aircraft Overhaul Plant Services Facility

Additional Information Northern corner of Building 397; approximate location shown on figure

Operational Information for SWMU

Type of Unit Oil-Water Separator

Capacity (gallons) Unknown

Period of Operation Unknown

Material Managed at SWMU Dirty water sump

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources Removal Action at Bldg 397 JP-5 Release (IT 1993)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

The goal of this evaluation is to verify that no CERCLA contaminants were detected and that integration with the TPH Program is appropriate. OWS-397D is located within CAA 13 and is surrounded by fuel lines on three sides. The OWS, 1 of 4, was installed near the eastern end of Building 397 to serve as a means of recycling oil from the waste stream before process water or stormwater was discharged to the storm drains. In 1991, a large spill (4,000 to 17,000 gallons of JP-5) was released from Building 397. Floor drains in the building were connected to OWSs. The spill caused associated OWSs to overflow. Refer to AOC 397 for cleanup activities. OWS 397D was removed in 1993 (Navy 1993) and is not a continuing potential source. Soil sample 210-IW-001, located approximately 15 feet southwest of the OWS, contains oil and grease at a concentration of 1,060 mg/kg. VOCs (ethylbenzene) in soil are consistent with fuel-related, petroleum-based contamination. No SVOCs, pesticides, or herbicides were detected in soil samples. Several PAHs, some fuel related (2-methylnaphthalene), were also detected in soil at low estimated concentrations, well below residential PRGs (EPA 2002). Detected metals concentrations exceeding 95 UCL concentrations (Blue Background Area) were also less than residential PRGs. This site is being evaluated under CAA 13 as part of the TPH program. Considering the past activities, the significant spill, and the type of contamination present, integration with the TPH Program is recommended.

Nondetect Review

NA

2002 Site Visit

Removed

Table G3-1: PROFILES FOR SOLID WASTE MANAGEMENT UNITS IN SITES 9, 13, 19, 22, AND 23 INTEGRATED WITH CERCLA PROGRAM

Solid Waste Management Unit Evaluation Report for Operable Unit 2A
Listed in CERCLA Site Order

SWMU Identifier **AOC 616** **Refer to Figure #** Figure G3-4

Navy Recommendation/Closure Status **NFA Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 19

EBS Subparcel 142 **TPH CAA** TPH CAA-04B

Associated Building 616 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Hazardous Material Storehouse

Additional Information Spill control for Building 616; USTs 616-1 and 616-2; Steel tanks; best-known location shown on figure

Operational Information for SWMU

Type of Unit Underground Storage Tank(s)

Capacity (gallons) 5,000 and 10,000 gallons

Period of Operation Unknown

Material Managed at SWMU Spill Control; held water

Source of Initial SWMU Identification

SWMU # in RFA AOC **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources NA

Tank-Related Information

Status of Tank Exempt (in place) **Status of Associated Pipes** NA

Data Analysis

AOC 616 refers to two closed-in-place, steel, spill-containment USTs (UST 616-1 and UST 616-2) installed north of Building 616 in CAA 4B at Site 19. The tanks had capacities of 5,000 and 10,000 gallons respectively. The USTs functioned as emergency overflow tanks for fire control and are not believed to have ever contained hazardous waste materials (IT 2001). Various soil and groundwater samples were collected in the vicinity as part of the TPH Program and analyzed for TPH, metals, VOCs, SVOCs (soil only), pesticides (soil only), and PAHs (soil only). Although analyzed, PAHs in soil and metals in soil and groundwater were not evaluated. As depicted on the figure for Site 19, TPH, VOCs, SVOCs, and pesticides were either not detected or detected at concentrations below PRCs (Navy 2001) and residential EPA PRGs (EPA 2002). Only benzene in one 1995 sample (372-12-ERM) at 1.1 ug/L slightly exceeded the MCL of 1 ug/L (California Department of Health Services 2003). April 2000 results for VOCs (including benzene, <0.5 ug/L) from a nearby location (CA04-02) were nondetect. The USTs were not considered likely sources of contamination (Tetra Tech 2005). Based on the absence of CERCLA contaminants in soil and groundwater, no further action is recommended for AOC 616.

Nondetect Review

Nondetect values were compared to 2004 Region 9 residential PRGs and Cal-modified PRGs, when available; groundwater nondetect values were also compared to California MCLs. All nondetect values for VOCs in soil less than PRGs except benzene in one sample. All nondetect values for SVOC in soil less than PRGs except: bis(2-chloroethyl)ether (four samples), 3,3'-dichlorobenzidine (one sample), 4,6-dinitro-2-methylphenol (one sample), hexachlorobenzene (4 samples), N-nitroso-di-N-propylamine (four samples), and pentachlorophenol (one sample). All nondetect values for pesticides in soil less than PRGs.

All nondetect values for VOCs in groundwater less than PRGs and MCLs (when available) except: benzene (one sample), carbon tetrachloride (one sample), chloroethane (one sample), chloroform (one sample), cis-1,3-dichloropropene (one sample), 1,2-dichloroethane (one sample), dibromochloromethane (one sample), bromodichloromethane (one sample), and trans-1,3-dichloropropene (one sample); the nondetect values were greater than PRGs but less than or equal to MCLs for benzene (five samples), 1,2-dichloropropane (one sample), tetrachloroethene (one sample), 1,1,2-trichloroethane (one sample), and 1,1,2,2-tetrachloroethane (one sample). Nondetect values were found to not be a problem as the SMWU contained water.

2002 Site Visit

NA

SWMU Identifier **OWS 547** **Refer to Figure #** NA

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 22

EBS Subparcel 145 **TPH CAA** TPH CAA-04C

Associated Building 547 **Building Status** Removed **Leasing Status** NA

Building Name Service Station and Car wash (partially demolished)

Additional Information South of pad for former car wash; best-known location shown on figure

Operational Information for SWMU

Type of Unit Oil-Water Separator

Capacity (gallons) 5 ft x 9 ft x 5 ft (deep)

Period of Operation Unknown

Material Managed at SWMU Unknown (associated with car wash)

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources TPH Data Gap Sampling Report (Tetra Tech 2001)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

OWS-547 is located within CAA 4C. The OWS was associated with a former car wash (Building 547-1) located at a former Navy gasoline service station, which operated from 1971 through 1980. No sampling has been conducted near the OWS. A data gap exists. Its function was to remove road grime and residues from the water used in the car wash process. The EBS documented no incidents within the building (IT 2001). The OU-2A RI report (Tetra Tech 2005) described the OWS as a likely source of contaminants in soil and groundwater at Site 22. Further action is recommended for OWS-547. A petroleum removal action is on going at Site 22. Recommendations for further action under CERCLA will be based only on CERCLA contaminants; TPH-related chemicals are being addressed under a corrective action plan.

Nondetect Review

NA

2002 Site Visit

OWS was observed during the 2002 site visit; it was inactive.

SWMU Identifier **UST(R)-17** **Refer to Figure #** NA

Navy Recommendation/Closure Status **NFA Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 22

EBS Subparcel 145 **TPH CAA** TPH CAA-04C

Associated Building 547 **Building Status** Removed **Leasing Status** NA

Building Name Service Station and Car wash (partially demolished)

Additional Information USTs 547-1, 547-2, and 547-3; Former, steel-clad, fiberglass-reinforced, plastic tanks; best-known location shown on figure

Operational Information for SWMU

Type of Unit Underground Storage Tank(s)

Capacity (gallons) 12,000 gallons each

Period of Operation Unknown

Material Managed at SWMU Gasoline

Source of Initial SWMU Identification

SWMU # in RFA UST-17 **Recommendation in RFA** RFI Not Required

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources NA

Tank-Related Information

Status of Tank Removed **Status of Associated Pipes** NA

Data Analysis

USTs 547-1 through 547-3 were 12,000-gallon tanks installed in 1971, and used to store leaded gasoline. These tanks were removed in 1994; they never contained waste. Two additional tanks, USTs 547-4 and 547-5, were listed in the RFA as waste oil tanks with capacities of 5,000 and 10,000 gallons, respectively; these were never confirmed as present and may have been the OWS for the car wash. USTs 547-1 through 547-3 are being addressed under the TPH Program based on the type of materials stored and associated sampling results. The USTs are within CAA 4C and CERCLA Site 22. Soil contamination (BTEX compounds) has been confirmed, exceeding the residential and nonresidential PRCs. Groundwater contamination has also been confirmed. Benzene and toluene in groundwater exceed MCLs (California Department of Health Services 2003). Total TPH exceeds the groundwater PRC for aquatic receptors (Navy 2001). Given the type of material stored (leaded gasoline) and the resulting contamination, this site is recommended for continued closure under the TPH Program.

Nondetect Review

NA

2002 Site Visit

NA

SWMU Identifier **AST 530A** **Refer to Figure #** Figure G3-5

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 23

EBS Subparcel 211 **TPH CAA** TPH CAA-13

Associated Building 530 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Missile Rework Facility (NARF)

Additional Information Southeast of Building 530; DeGas Area; 1 of 3 tanks; approximate location shown on figure

Operational Information for SWMU

Type of Unit Aboveground Storage Tank(s)

Capacity (gallons) 10,000

Period of Operation Unknown

Material Managed at SWMU 1010 oil

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources BRAC Cleanup Plan (1998)

Tank-Related Information

Status of Tank Removed **Status of Associated Pipes** Partially removed; piping coming out of the ground surrounded by a traffic barricade is all that remains

Data Analysis

Multiple sampling locations are shown without hit boxes in the vicinity of ASTs 530A, 530B, and 530C on the figure for CERCLA Site 23. These ASTs contained 1010 oil, fuel or oil, and jet fuel respectively. Sampling results from all of these locations were assessed in this evaluation. Significant TPH contamination exceeding PRCs (Navy 2001) for soil and groundwater was detected in samples near the former AST locations. Detected concentrations suggest the potential for free product. VOC concentrations (BTEX and potential laboratory contaminants, acetone and 2-butanone) in soil did not exceed residential PRCs and PRGs (EPA 2002). Benzene concentrations in groundwater exceeded the MCL (California Department of Health Services 2003). No SVOCs were detected in soil (with the exception of a potential laboratory contaminant, bis(2-ethylhexyl)phthalate) and groundwater. No pesticides were detected in soil. Fuel-related PAHs (2-methylnaphthalene and naphthalene) were detected in soil and groundwater. The former AST locations are within CAA 13. Considering the past activities, the types of materials stored in the ASTs (1010 oil, fuel or oil, and jet fuel), and the type of contamination present, closure under the TPH Program is recommended.

Nondetect Review

NA

2002 Site Visit

AST removed prior to 2002 site visit.

SWMU Identifier **AST 530B** **Refer to Figure #** Figure G3-5

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 23

EBS Subparcel 211 **TPH CAA** TPH CAA-13

Associated Building 530 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Missile Rework Facility (NARF)

Additional Information Southeast of Building 530; DeGas Area; 2 of 3 tanks; approximate location shown on figure

Operational Information for SWMU

Type of Unit Aboveground Storage Tank(s)

Capacity (gallons) 10,000

Period of Operation Unknown

Material Managed at SWMU Fuel or oil

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources BRAC Cleanup Plan (1998)

Tank-Related Information

Status of Tank	Removed; damaged by 1989 earthquake, remained empty from that date	**Status of Associated Pipes**	Partially removed; piping coming out of the ground surrounded by a traffic barricade is all that remains

Data Analysis

Refer to AST 530A

Nondetect Review

NA

2002 Site Visit

AST removed prior to 2002 site visit.

SWMU Identifier **AST 530C** **Refer to Figure #** Figure G3-5

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 23

EBS Subparcel 211 **TPH CAA** TPH CAA-13

Associated Building 530 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Missile Rework Facility (NARF)

Additional Information Southeast of Building 530; DeGas Area; 3 of 3 tanks; approximate location shown on figure

Operational Information for SWMU

Type of Unit Aboveground Storage Tank(s)

Capacity (gallons) 15,000

Period of Operation Unknown

Material Managed at SWMU Jet fuel

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources BRAC Cleanup Plan (1998)

Tank-Related Information

Status of Tank Removed **Status of Associated Pipes** Partially removed; piping coming out of the ground surrounded by a traffic barricade is all that remains

Data Analysis

Refer to AST 530A

Nondetect Review

NA

2002 Site Visit

AST removed prior to 2002 site visit.

SWMU Identifier **NADEP GAP 63** **Refer to Figure #** Figure G3-5

Navy Recommendation/Closure Status **NFA Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 23

EBS Subparcel 148 **TPH CAA** NA

Associated Building 530 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Missile Rework Facility (NARF)

Additional Information Building 530 (inside), Shop 94224; approximate location shown on figure

Operational Information for SWMU

Type of Unit	Generator Accumulation Point
Capacity (gallons)	5-gallon containers, 30-gallon drums, 55-gallon drums
Period of Operation	GAPs were formally identified in 1987 and continued to operate until base closure and building cleanup was initiated in 1997. Actual startup dates are unknown.
Material Managed at SWMU	Acetone, naphtha with solvents (MEK), poly paint and thinner, 1,1,1-TCA, and MX-4M solvent

Source of Initial SWMU Identification

SWMU # in RFA GI-46 **Recommendation in RFA** RFI Not Required

Recommended for NFA from DTSC in 1999 Yes

SWMU Identified in Other Sources NA

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

NADEP GAP 63 consisted of various size storage drums atop a wooden pallet (to allow a forklift to move the drums) or atop a poly spill pallet, which acted as a secondary containment system. The area measured approximately 6 feet by 6 feet and was located inside Building 530 in Shop 94224, near the western wall. According to the RFA, NADEP GAP 63 exhibited a low potential for releases into soil and groundwater because the site was located indoors on a concrete floor (DTSC 1992). An RFI was not required (DTSC 1992). The Phase I EBS concluded that NADEP GAP 63 did not require further investigation because the site was paved and site inspectors did not observe staining (ERM-West 1994). A letter from DTSC dated November 4, 1999, recommended NFA for this SWMU (DTSC 1999). A description of NADEP GAP 63 was included in the EBS, Zone 22, Parcel 148 evaluation data summary report (IT 2001). The GAP was indirectly investigated as Target Area 1 (Building 530) during EBS Phase 2A soil sampling. Soil was sampled from beneath the building floor (3.5 to 4 feet bgs) near the GAP. Samples were analyzed for TPH, metals, VOCs, SVOCs, and PAHs. As depicted on the figure for Site 23, all soil analytes were either not detected or detected at concentrations below residential EPA PRGs (EPA 2002). The reporting limit for mercury slightly exceeded the residential PRG. The detections of nickel and zinc are below the 95 UCL for the Blue Background Area (Tetra Tech 2001b). NADEP GAP 63 was not listed as a potential source of soil and groundwater contamination at Site 23 in the OU-2A RI report (Tetra Tech 2005). NFA is recommended for NADEP GAP 63.

Nondetect Review

NA

2002 Site Visit

NA

SWMU Identifier **NADEP GAP 63A** **Refer to Figure #** NA

Navy Recommendation/Closure Status **NFA Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 23

EBS Subparcel 148 **TPH CAA** NA

Associated Building 530 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Missile Rework Facility (NARF)

Additional Information Building 530 (inside), Shop 94223; approximate location shown on figure

Operational Information for SWMU

Type of Unit Generator Accumulation Point

Capacity (gallons) 55-gallon drums & Bowser

Period of Operation GAPs were formally identified in 1987 and continued to operate until base closure and building cleanup was initiated in 1997. Actual startup dates are unknown.

Material Managed at SWMU Hydraulic oil (Bowser)

Source of Initial SWMU Identification

SWMU # in RFA GI-47 **Recommendation in RFA** RFI Not Required

Recommended for NFA from DTSC in 1999 Yes

SWMU Identified in Other Sources NA

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

NADEP GAP 63A was a Bowser of hydraulic oil. A modified, 55-gallon-drum, wet/dry vacuum used to vacuum up spills sat adjacent to the Bowser. The area measured approximately 4 feet by 12 feet and was located inside Building 530 in Shop 94223. According to the RFA, NADEP GAP 63A exhibited a low potential for releases into soil and groundwater because the site was located indoors on a flat, tile-covered, concrete floor (DTSC 1992). An RFI was not required (DTSC 1992). The Phase I EBS concluded that NADEP GAP 63A did not require further investigation because the site was paved and site inspectors did not observe staining (ERM-West 1994). A letter from DTSC dated November 4, 1999, recommended NFA for this SWMU (DTSC 1999). A description of NADEP GAP 63A was included in the EBS, Zone 22, Parcel 148 evaluation data summary report (IT 2001). NADEP GAP 63A was not listed as a potential source of soil and groundwater contamination at Site 23 in the OU-2A RI report (Tetra Tech 2005). NFA is recommended for NADEP GAP 63A.

Nondetect Review

NA

2002 Site Visit

NA

SWMU Identifier **NADEP GAP 64** **Refer to Figure #** NA

Navy Recommendation/Closure Status **NFA Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 23

EBS Subparcel 148 **TPH CAA** NA

Associated Building 530 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Missile Rework Facility (NARF)

Additional Information Building 530 (inside), Shop 94224; approximate location shown on figure

Operational Information for SWMU

Type of Unit	Generator Accumulation Point
Capacity (gallons)	30-gallon drums, 55-gallon drums, aerosol cans
Period of Operation	GAPs were formally identified in 1987 and continued to operate until base closure and building cleanup was initiated in 1997. Actual startup dates are unknown.
Material Managed at SWMU	Aerosol paint, lubrication, solvents, rust remover, WD-40; MX-4M solvent, silicate ester, and 1,1,1-TCA

Source of Initial SWMU Identification

SWMU # in RFA GI-48 **Recommendation in RFA** RFI Not Required

Recommended for NFA from DTSC in 1999 Yes

SWMU Identified in Other Sources NA

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

NADEP GAP 64 consisted of 30- and 55-gallon drums on two pallets, each atop poly spill pallets, all within a metal tray. The area measured approximately 8 feet by 18 feet and was located inside Building 530 in Shop 94224. According to the RFA, NADEP GAP 64 exhibited a low potential for releases into soil and groundwater because the site was located indoors on a flat concrete floor (DTSC 1992). An RFI was not required (DTSC 1992). The Phase I EBS concluded that NADEP GAP 64 did not require further investigation because the site was paved and site inspectors did not observe staining (ERM-West 1994). A letter from DTSC dated November 4, 1999, recommended NFA for this SWMU (DTSC 1999). A description of NADEP GAP 64 was included in the EBS, Zone 22, Parcel 148 evaluation data summary report (IT 2001). NADEP GAP 64 was not listed as a potential source of soil and groundwater contamination at Site 23 in the OU-2A RI report (Tetra Tech 2005). NFA is recommended for NADEP GAP 64.

Nondetect Review

NA

2002 Site Visit

NA

SWMU Identifier **OWS 529** **Refer to Figure #** Figure G3-5

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 23

EBS Subparcel 211 **TPH CAA** TPH CAA-13

Associated Building 529 **Building Status** Present **Leasing Status** Not leased by ARRA

Building Name Switching/Substation Building/Shelter

Additional Information West of former ASTs that were located west of Building 529; OWS is located at eastern end of Avenue M; approximate location shown on figure

Operational Information for SWMU

Type of Unit Oil-Water Separator

Capacity (gallons) 5 ft x 5 ft x 4 ft (deep)

Period of Operation Unknown

Material Managed at SWMU Unknown

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources CERFA EBS (ERM-West 1994)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

OWS-529 is located within CAA 13 and CERCLA Site 23. According to the EBS, this area was used for defueling (IT 2001). The OWS is located west of three former ASTs. The closest soil sampling location, 211-IWC0-001 located approximately 18 feet southeast of OWS-529, contains TPH-gasoline and TPH-diesel above the residential PRCs (Navy 2001). The TPH-diesel result also exceeded the nonresidential criteria. Oil and grease was detected at 5,980 mg/kg. In general, significant TPH contamination exceeding PRCs for soil and groundwater was detected in samples collected within 100 feet of the OWS location. Detected concentrations suggest the potential for free product. VOC concentrations (BTEX and potential laboratory contaminants) in soil did not exceed residential PRCs or PRGs (EPA 2002). Benzene concentrations in groundwater exceeded the MCL (California Department of Health Services 2003). No SVOCs were detected in soil (with the exception of a potential laboratory contaminant, bis(2-ethylhexyl)phthalate) and groundwater. No pesticides were detected in soil. Fuel-related PAHs (2-methylnaphthalene and naphthalene) were detected in soil and groundwater. Detected metals concentrations in soil exceeding 95 UCL concentrations (Blue Background Area) were less than residential PRGs. The Navy is conducting groundwater remediation for petroleum contamination in this area. This site is also being evaluated under CAA 13 as part of the TPH program. The OWS is a likely source of petroleum contaminants in soil and groundwater (Tetra Tech 2005). Considering the nearby petroleum ASTs and the type of contamination present, integration with the TPH Program is recommended.

Nondetect Review

NA

2002 Site Visit

OWS was observed during the 2002 site visit; it was inactive.

SWMU Identifier **OWS 530** **Refer to Figure #** Figure G3-5

Navy Recommendation/Closure Status **Further Action Recommended**

Location Description

Disposal Parcel EDC 10 **CERCLA Site** 23

EBS Subparcel 148 **TPH CAA** TPH CAA-13

Associated Building 530 **Building Status** Present **Leasing Status** Leased by ARRA

Building Name Missile Rework Facility (NARF)

Additional Information Nothwestern corner of fenced area; west of Building 530; associated with DeGas Area; best-known location shown on figure

Operational Information for SWMU

Type of Unit Oil-Water Separator

Capacity (gallons) 6.5 ft x 13 ft (depth unknown)

Period of Operation Unknown

Material Managed at SWMU Unknown

Source of Initial SWMU Identification

SWMU # in RFA Not identified in RFA **Recommendation in RFA** NA

Recommended for NFA from DTSC in 1999 NA

SWMU Identified in Other Sources TPH Data Gap Sampling Report (Tetra Tech 2001)

Tank-Related Information

Status of Tank NA **Status of Associated Pipes** NA

Data Analysis

OWS-530 is located within CAA 13 and CERCLA Site 23. Groundwater sample SHP-S10B-05, located to the north of the OWS 530, shows TPH concentrations exceeding the total TPH PRC for aquatic receptors (Navy 2001). VOCs (2-butanone) detected in groundwater are most likely laboratory contaminants. At the deeper DHP-S10B-05 location, TPH concentrations in groundwater were nondetect. Low-level, estimated concentrations of SVOCs (phenol and 2,4-dichlorophenol) and PAHs were detected in groundwater. Selected dissolved metals (iron and manganese) in groundwater were detected above the 95 UCL and also exceeded secondary MCLs (California Department of Health Services 2003). The Navy is conducting groundwater remediation for petroleum contamination in this area. This site is also being evaluated under CAA 13 as part of the TPH program. The OWS is a likely source of petroleum contaminants in soil and groundwater (Tetra Tech 2005). Considering the type of contamination present, integration with the TPH Program is recommended.

Nondetect Review

NA

2002 Site Visit

OWS was observed during the 2002 site visit; it was inactive.

Notes:

% = Percentage
ug/kg = Micrograms per kilogram
ug/L = Micrograms per liter
AOC = Area of concern
ARRA = Alameda Reuse and Redevelopment Authority
AST = Aboveground storage tank
bgs = Below ground surface
BTEX = Benzene, toluene, ethylbenzene, and xylene
CAA = Corrective action area
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CERFA = Community Environmental Response Facilitation Act
CRS = Coolant Recovery System
DTSC = California Environmental Protection Agency Department of Toxic Substances Control
EBS = Environmental baseline survey
EDC = Economic development conveyance
EPA = U.S. Environmental Protection Agency
ERM-West = Environmental Resource Management - West
FED = Federal agency-to-agency transfer
FS = Feasibility Study
FSP = Field sampling plan
ft = Foot
Gal = gallon
GAP = Generator accumulation point
GW = Groundwater
ID = Identification
IT = International Technology Corporation
IWTP = Industrial wastewater treatment plant
JP = Jet propellant
M = Miscellaneous area identified in the RFA
MCL = Maximum contaminant level
MEK = Methyl ethyl ketone
mg/kg = Milligrams per kilogram
mg/L = milligrams per liter
mL = milliliter
NA = Not applicable
NADEP = Naval Aviation Depot Alameda
NARF = Naval Air Rework Facility Alameda
NAS = Naval Air Station
Navy = U.S. Department of the Navy
ND = Not detected
NE = Northeast
NFA = No further action
NW = Northwest
OU = Operable Unit
OWS = Oil-water separator
PAH = Polynuclear aromatic hydrocarbon
PCB = Polychlorinated biphenyl
PMB = Plastic material blasting
PPM = Parts per million
PRC = Preliminary remediation criteria
PRG = Preliminary remediation goal
PWC = Navy Public Works Center
(R) = RCRA-related UST
RCRA = Resource Conservation and Recovery Act
RFA = RCRA facility assessment
RFI = RCRA facility investigation
RI = Remedial investigation
RI/FS = Remedial investigation and feasibility study
RWQCB = Regional Water Quality Control Board
SE = Southeast
SEBS = Supplemental environmental baseline survey
SSPORTS = Supervisor of Shipbuilding, Conversion, and Repair, Portsmouth, Virginia
SVOC = Semivolatile organic compound
SW = Southwest
SWARF = Refers to machine and grinding coolant
SWMU = Solid waste management unit
TCA = Trichloroethane
Tetra Tech = Tetra Tech EM Inc.
TPH = Total petroleum hydrocarbon
TPHd = Total petroleum hydrocarbons as diesel
TPHg = Total petroleum hydrocarbons as gasoline
TPHmo = Total petroleum hydrocarbons as motor oil
USFWS = U.S. Fish and Wildlife Service
UST = Underground storage tank
VOC = Volatile organic compound
WD = Washdown area

APPENDIX H
HUMAN HEALTH RISK ASSESSMENT

AECRU Contract Number N68711-00-D-0005
Delivery Order 028

APPENDIX H
DRAFT FINAL HUMAN HEALTH RISK ASSESSMENT
SITES 9, 13, 19, 22, AND 23
Operable Unit 2A
ALAMEDA POINT

February 2005

Prepared for

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H-7.2.3.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 13, Hypothetical Future Adult Resident
H-7.2.4.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 13, Hypothetical Future Child Resident

H-7.2.5.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 13, Hypothetical Future Developed Construction Worker

H-7.2.6.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 13, Hypothetical Future Redeveloped Adult Resident

H-7.2.7.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 13, Hypothetical Future Redeveloped Child Resident

Site 19 Chemical Noncancer Hazards

H-7.3.1.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 19, Current/Future Industrial Worker

H-7.3.2.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 19, Hypothetical Future Construction Worker

H-7.3.3.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 19, Hypothetical Future Adult Resident

H-7.3.4.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 19, Hypothetical Future Child Resident

H-7.3.5.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 19, Hypothetical Future Developed Construction Worker

H-7.3.6.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 19, Hypothetical Future Redeveloped Adult Resident

H-7.3.7.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 19, Hypothetical Future Redeveloped Child Resident

Site 22 Chemical Noncancer Hazards

H-7.4.1.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 22, Current/Future Industrial Worker

H-7.4.2.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 22, Hypothetical Future Construction Worker

H-7.4.3.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 22, Hypothetical Future Adult Resident

H-7.4.4.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 22, Hypothetical Future Child Resident

H-7.4.5.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 22, Hypothetical Future Developed Construction Worker

H-7.4.6.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 22, Hypothetical Future Redeveloped Adult Resident

H-7.4.7.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 22, Hypothetical Future Redeveloped Child Resident

Site 23 Chemical Noncancer Hazards

H-7.5.1.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 23, Current/Future Industrial Worker

H-7.5.2.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 23, Hypothetical Future Construction Worker

H-7.5.3.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 23, Hypothetical Future Adult Resident

H-7.5.4.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 23, Hypothetical Future Child Resident

H-7.5.5.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 23, Hypothetical Future Developed Construction Worker

H-7.5.6.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 23, Hypothetical Future Redeveloped Adult Resident

H-7.5.7.RME EPA RAGS Part D Table 7b, Calculation of RME Chemical Noncancer Hazards, Site 23, Hypothetical Future Redeveloped Child Resident

Site 9 Chemical Cancer Risks

H-8.1.1.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 9, Current/Future Industrial Worker

H-8.1.2.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 9, Hypothetical Future Construction Worker

H-8.1.3.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 9, Hypothetical Future Adult Resident

H-8.1.4.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 9, Hypothetical Future Child Resident

H-8.1.5.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 9, Hypothetical Future Developed Construction Worker

H-8.1.6.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 9, Hypothetical Future Redeveloped Adult Resident

H-8.1.7.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 9, Hypothetical Future Redeveloped Child Resident

Site 13 Chemical Cancer Risks

H-8.2.1.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 13, Current/Future Industrial Worker

H-8.2.2.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 13, Hypothetical Future Construction Worker

H-8.2.3.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 13, Hypothetical Future Adult Resident

H-8.2.4.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 13, Hypothetical Future Child Resident

H-8.2.5.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 13, Hypothetical Future Developed Construction Worker

H-8.2.6.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 13, Hypothetical Future Redeveloped Adult Resident

H-8.2.7.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 13, Hypothetical Future Redeveloped Child Resident

Site 19 Chemical Cancer Risks

H-8.3.1.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 19, Current/Future Industrial Worker

H-8.3.2.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 19, Hypothetical Future Construction Worker

H-8.3.3.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 19, Hypothetical Future Adult Resident

H-8.3.4.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 19, Hypothetical Future Child Resident

H-8.3.5.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 19, Hypothetical Future Developed Construction Worker

H-8.3.6.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 19, Hypothetical Future Redeveloped Adult Resident

H-8.3.7.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 19, Hypothetical Future Redeveloped Child Resident

Site 22 Chemical Cancer Risks

H-8.4.1.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 22, Current/Future Industrial Worker

H-8.4.2.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 22, Hypothetical Future Construction Worker

H-8.4.3.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 22, Hypothetical Future Adult Resident

H-8.4.4.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 22, Hypothetical Future Child Resident

H-8.4.5.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 22, Hypothetical Future Developed Construction Worker

H-8.4.6.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 22, Hypothetical Future Redeveloped Adult Resident

H-8.4.7.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 22, Hypothetical Future Redeveloped Child Resident

Site 23 Chemical Cancer Risks

H-8.5.1.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 23, Current/Future Industrial Worker

H-8.5.2.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 23, Hypothetical Future Construction Worker

H-8.5.3.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 23, Hypothetical Future Adult Resident

H-8.5.4.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 23, Hypothetical Future Child Resident

H-8.5.5.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 23, Hypothetical Future Developed Construction Worker

H-8.5.6.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 23, Hypothetical Future Redeveloped Adult Resident

H-8.5.7.RME EPA RAGS Part D Table 7a, Calculation of RME Chemical Cancer Risks, Site 23, Hypothetical Future Redeveloped Child Resident

Site 9 Summaries of Receptor Risks and Hazards for COPCs

H-9.1.1.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 9, Current/Future Industrial Worker

H-9.1.2.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 9, Hypothetical Future Construction Worker

H-9.1.3.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 9, Hypothetical Future Adult Resident

H-9.1.4.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 9, Hypothetical Future Child Resident

H-9.1.5.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 9, Hypothetical Future Developed Construction Worker

H-9.1.6.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 9, Hypothetical Future Redeveloped Adult Resident

H-9.1.7.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 9, Hypothetical Future Redeveloped Child Resident

Site 13 Summaries of Receptor Risks and Hazards for COPCs

H-9.2.1.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 13, Current/Future Industrial Worker

H-9.2.2.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 13, Hypothetical Future Construction Worker

H-9.2.3.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 13, Hypothetical Future Adult Resident

H-9.2.4.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 13, Hypothetical Future Child Resident

H-9.2.5.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 13, Hypothetical Future Developed Construction Worker

H-9.2.6.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 13, Hypothetical Future Redeveloped Adult Resident

H-9.2.7.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 13, Hypothetical Future Redeveloped Child Resident

Site 19 Summaries of Receptor Risks and Hazards for COPCs

H-9.3.1.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 19, Current/Future Industrial Worker

H-9.3.2.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 19, Hypothetical Future Construction Worker

H-9.3.3.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 19, Hypothetical Future Adult Resident

H-9.3.4.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 19, Hypothetical Future Child Resident

H-9.3.5.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 19, Hypothetical Future Developed Construction Worker

H-9.3.6.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 19, Hypothetical Future Redeveloped Adult Resident

H-9.3.7.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 19, Hypothetical Future Redeveloped Child Resident

Site 22 Summaries of Receptor Risks and Hazards for COPCs

H-9.4.1.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 22, Current/Future Industrial Worker

H-9.4.2.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 22, Hypothetical Future Construction Worker

H-9.4.3.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 22, Hypothetical Future Adult Resident

H-9.4.4.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 22, Hypothetical Future Child Resident

H-9.4.5.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 22, Hypothetical Future Developed Construction Worker

H-9.4.6.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 22, Hypothetical Future Redeveloped Adult Resident

H-9.4.7.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 22, Hypothetical Future Redeveloped Child Resident

Site 23 Summaries of Receptor Risks and Hazards for COPCs

H-9.5.1.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 23, Current/Future Industrial Worker

H-9.5.2.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 23, Hypothetical Future Construction Worker

H-9.5.3.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 23, Hypothetical Future Adult Resident

H-9.5.4.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 23, Hypothetical Future Child Resident

H-9.5.5.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 23, Hypothetical Future Developed Construction Worker

H-9.5.6.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 23, Hypothetical Future Redeveloped Adult Resident

H-9.5.7.RME EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards for COPCs, Site 23, Hypothetical Future Redeveloped Child Resident

Site 9 Risk Summaries

H-10.1.1.RME EPA RAGS Part D Table 10, Risk Summary, Site 9, Current/Future Industrial Worker

H-10.1.2.RME EPA RAGS Part D Table 10, Risk Summary, Site 9, Hypothetical Future Construction Worker

H-10.1.3.RME EPA RAGS Part D Table 10, Risk Summary, Site 9, Hypothetical Future Adult Resident

H-10.1.4.RME EPA RAGS Part D Table 10, Risk Summary, Site 9, Hypothetical Future Child Resident

H-10.1.5.RME EPA RAGS Part D Table 10, Risk Summary, Site 9, Hypothetical Future Developed Construction Worker

H-10.1.6.RME EPA RAGS Part D Table 10, Risk Summary, Site 9, Hypothetical Future Redeveloped Adult Resident

H-10.1.7.RME EPA RAGS Part D Table 10, Risk Summary, Site 9, Hypothetical Future Redeveloped Child Resident

Site 13 Risk Summaries

H-10.2.1.RME EPA RAGS Part D Table 10, Risk Summary, Site 13, Current/Future Industrial Worker

H-10.2.2.RME EPA RAGS Part D Table 10, Risk Summary, Site 13, Hypothetical Future Construction Worker

H-10.2.3.RME EPA RAGS Part D Table 10, Risk Summary, Site 13, Hypothetical Future Adult Resident

H-10.2.4.RME EPA RAGS Part D Table 10, Risk Summary, Site 13, Hypothetical Future Child Resident

H-10.2.5.RME EPA RAGS Part D Table 10, Risk Summary, Site 13, Hypothetical Future Developed Construction Worker

H-10.2.6.RME EPA RAGS Part D Table 10, Risk Summary, Site 13, Hypothetical Future Redeveloped Adult Resident

H-10.2.7.RME EPA RAGS Part D Table 10, Risk Summary, Site 13, Hypothetical Future Redeveloped Child Resident

Site 19 Risk Summaries

H-10.3.1.RME EPA RAGS Part D Table 10, Risk Summary, Site 19, Current/Future Industrial Worker

H-10.3.2.RME EPA RAGS Part D Table 10, Risk Summary, Site 19, Hypothetical Future Construction Worker

H-10.3.3.RME EPA RAGS Part D Table 10, Risk Summary, Site 19, Hypothetical Future Adult Resident

H-10.3.4.RME EPA RAGS Part D Table 10, Risk Summary, Site 19, Hypothetical Future Child Resident

H-10.3.5.RME EPA RAGS Part D Table 10, Risk Summary, Site 19, Hypothetical Future Developed Construction Worker

H-10.3.6.RME EPA RAGS Part D Table 10, Risk Summary, Site 19, Hypothetical Future Redeveloped Adult Resident

H-10.3.7.RME EPA RAGS Part D Table 10, Risk Summary, Site 19, Hypothetical Future Redeveloped Child Resident

Site 22 Risk Summaries

H-10.4.1.RME EPA RAGS Part D Table 10, Risk Summary, Site 22, Current/Future Industrial Worker

H-10.4.2.RME EPA RAGS Part D Table 10, Risk Summary, Site 22, Hypothetical Future Construction Worker

H-10.4.3.RME EPA RAGS Part D Table 10, Risk Summary, Site 22, Hypothetical Future Adult Resident

H-10.4.4.RME EPA RAGS Part D Table 10, Risk Summary, Site 22, Hypothetical Future Child Resident

H-10.4.5.RME EPA RAGS Part D Table 10, Risk Summary, Site 22, Hypothetical Future Developed Construction Worker

H-10.4.6.RME EPA RAGS Part D Table 10, Risk Summary, Site 22, Hypothetical Future Redeveloped Adult Resident

H-10.4.7.RME EPA RAGS Part D Table 10, Risk Summary, Site 22, Hypothetical Future Redeveloped Child Resident

Site 23 Risk Summaries

H-10.5.1.RME EPA RAGS Part D Table 10, Risk Summary, Site 23, Current/Future Industrial Worker

H-10.5.2.RME EPA RAGS Part D Table 10, Risk Summary, Site 23, Hypothetical Future Construction Worker

H-10.5.3.RME EPA RAGS Part D Table 10, Risk Summary, Site 23, Hypothetical Future Adult Resident

H-10.5.4.RME	EPA RAGS Part D Table 10, Risk Summary, Site 23, Hypothetical Future Child Resident
H-10.5.5.RME	EPA RAGS Part D Table 10, Risk Summary, Site 23, Hypothetical Future Developed Construction Worker
H-10.5.6.RME	EPA RAGS Part D Table 10, Risk Summary, Site 23, Hypothetical Future Redeveloped Adult Resident
H-10.5.7.RME	EPA RAGS Part D Table 10, Risk Summary, Site 23, Hypothetical Future Redeveloped Child Resident

ACRONYMS AND ABBREVIATIONS

Army	U.S. Department of the Army
ACFCWCD	Alameda County Flood Control and Water Conservation District
ARRA	Alameda Reuse and Redevelopment Authority
AST	Aboveground storage tank
ATSDR	Agency for Toxic Substances and Disease Registry
BCT	Base Realignment and Closure Cleanup Team
bgs	Below ground surface
BKF	Benzo(k)fluoranthene
BRAC	Base Realignment and Closure
BTEX	Benzene, toluene, ethylbenzene, and xylenes
Cal/EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract laboratory program
COPC	Constituent of potential concern
CSM	Conceptual site model
CTE	Central tendency exposure
DCA	Dichloroethane
DCE	Dichloroethene
DQO	Data quality objective
DTSC	California Environmental Protection Agency Department of Toxic Substances Control
EBS	Environmental baseline survey
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
FI	Fraction ingested
F_{oc}	Fraction organic carbon content in soil
FOD	Frequency of detection
FS	Feasibility study
FWBZ	First water-bearing zone
g/kg-day	Grams per kilogram per day
GAP	Generator accumulation points

HEAST	Health Effects Assessment Summary Tables
HHRA	Human health risk assessment
HI	Hazard index
HQ	Hazard quotient
IRIS	Integrated Risk Information System
kg	Kilogram
K_{oc}	Organic carbon-water partition coefficient
K_{ow}	Octanol-water partition coefficient
LNAPL	Light non-aqueous phase liquid
LOAEL	Lowest adverse effect level
MCL	Maximum contaminant level
$\mu g/m^3$	Micrograms per cubic meter
µmhos/cm	Micromhos per centimeter
µg/dL	Microgram per deciliter
mg/kg	Milligram per kilogram
Mg/kg-day	Milligrams per kilogram per day
mg/L	Milligram per liter
MTBE	Methyl tertiary-butyl ether
NACIP	Navy Assessment and Control of Installation Pollutant
NADEP	Naval Air Depot
NAPL	Non-aqueous phase liquid
NARF	Naval Area Rework Facility
NAS	Naval Air Station
Navy	U.S. Department of the Navy
NCEA	National Center for Environmental Assessment
NOAEL	No adverse effect level
NTP	National Toxicology Program
OEHHA	Office of Environmental Health Hazard Assessment
OU	Operable unit
PAH	Poly-nuclear aromatic hydrocarbons
PCA	Tetrachloroethane

PCE	Tetrachloroethene
PEF	Particulate emission factor
PRG	Preliminary remediation goal
R&D	Research and development
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
REL	Reference exposure level
RfC	Reference concentration
RfD	Reference dose
RI	Remedial investigation
RME	Reasonable maximum exposure
RWQCB	California Regional Water Quality Control Board
SF	Cancer slope factor
SQL	Sample quantitation limit
SVOC	Semivolatile organic compound
SWBZ	Shallow water bearing zone
SWRCB	California State Water Resources Control Board
TCA	Trichloroethane
TCE	Trichloroethene
TDS	Total dissolved solids
Tetra Tech	Tetra Tech EM Inc.
TPH	Total petroleum hydrocarbons
UCL_{95}	95th percentile upper confidence limit on the arithmetic mean
µg/L	Micrograms per liter
UST	Underground storage tank
VOC	Volatile organic compound

1.0 INTRODUCTION

The U.S. Department of the Navy (Navy) is conducting a remedial investigation (RI) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (U.S. Environmental Protection Agency [EPA] 1988). The CERCLA Sites 9, 13, 19, 22, and 23 comprise Operable Unit 2A (OU-2A) at Alameda Point (formerly Naval Air Station [NAS] Alameda), located in Alameda, California. The human health risk assessment (HHRA) methodology and summary of results for OU-2A are presented in this report.

The organization of the HHRA and methodology used to evaluate human health risks are in accordance with the "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)" (EPA 1989) as well as subsequent Risk Assessment Guidance for Superfund (RAGS) Part D (EPA 2001c) for standard table presentation and format.

This report is organized as follows: The objectives and scope of the HHRA are described in Section 2. Background information is presented in Section 3. The methodology for data grouping and identification of chemicals of concern is provided in Section 4. The exposure assessment is described in Section 5. Section 6 presents the toxicity assessment for all chemicals of concern. Site-specific risk assessment results are presented in Section 7. The uncertainty analysis is contained in Section 8. References are provided in Section 9. Attachments H1 through H6 follow the figures and tables, which follow this main appendix text.

2.0 OBJECTIVES AND SCOPE

Site-specific HHRAs conducted for Alameda Point estimate potential human health risks associated with possible exposure to site-related chemicals. This baseline HHRA was conducted without regard to future remediation activities; however, reductions in chemical concentrations associated with past removal activities were considered in this evaluation.

HHRAs are prepared to evaluate potential health risks under current and future land use conditions. The specific objectives of this HHRA are as follows:

- Estimate the magnitude of potential human health risks associated with current and hypothetical future land use conditions
- Identify the environmental media and contaminants that pose the primary health concerns
- Identify the environmental media and contaminants that pose little or no threat to human health
- Provide the basis to support risk management decisions about the need for further action in the feasibility study (FS)

The HHRA was conducted in accordance with methods detailed in EPA guidance (EPA 1989) and "Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities" (California Environmental Protection Agency [Cal/EPA] Department of Toxic Substances Control [DTSC] 1992). In an effort to expedite the RI/FS process and streamline the review and comment process of the HHRA, DTSC, the Regional Water Quality Control Board (RWQCB), and EPA Region IX regional policy positions were incorporated. The EPA and DTSC framework consists of the following four basic steps:

- **Data Evaluation and Selection of Chemicals of Potential Concern (COPC):** This step consists of evaluating the analytical data for usability in the HHRA, grouping analytical data by site and by medium, and selecting COPCs in site media.

- **Exposure Assessment:** This step involves evaluating potential exposure pathways to the COPCs and human populations that might be exposed to them under current or future site conditions. Exposure point concentrations (EPC) are estimated from measured or modeled concentrations, and pathway-specific intakes (doses) are estimated using hypothetical receptors for evaluation in the subsequent risk calculations.

- **Toxicity Assessment:** This step consists of compiling toxicity values that characterize potential adverse health effects of exposure to COPCs.

- **Risk Characterization:** This step combines the results of the previous steps to quantitatively characterize potential human health risks associated with exposure to COPCs at the area under evaluation. Both potential cancer risks and hazard indices (HI), a measure of the potential for adverse health effects other than cancer, are evaluated.

This HHRA also is consistent with Navy policy for conducting HHRAs (Navy 2001). This policy presents a three-tiered approach for conducting HHRAs as follows:

- **Tier 1 – Screening Assessment.** The preliminary (or "Tier 1") screening risk assessment to identify COPCs by comparing the maximum detected concentration of each chemical in each medium to an appropriate "risk-based criteria." Based on this screening, sites may be eliminated from further evaluation if concentrations of all detected chemicals are less than the risk-based criteria. Chemicals with detected concentrations exceeding risk-based criteria are retained as COPCs and evaluated in Tier 2.

- **Tier 2 – Baseline HHRA.** This step is more rigorous than Tier 1 and involves the quantification of adverse health effects to hypothetical human receptors.

- **Tier 3 – Evaluation of Remedial Alternatives.** This step involves the evaluation of remedial alternatives and is based on the determination of unacceptable risks. Dependent upon the results of the evaluation in Tier 2, an evaluation of remedial alternatives may be initiated as part of Tier 3, which may be conducted during the FS.

Tiers 1 and 2 of the Navy policy are applied in this HHRA. Specifically, the HHRA incorporates the Tier 1 screening assessment into the COPC selection step. Chemicals retained as COPCs were then evaluated in a quantitative risk assessment in the remaining three steps of the HHRA (exposure assessment, toxicity assessment, and risk characterization), which comprise the Navy Tier 2 baseline risk assessment.

3.0 BACKGROUND

Originally a peninsula, Alameda Island was detached from the mainland in 1876, when a channel was cut to link San Leandro Bay with the San Francisco Bay. The northern portion of Alameda Island was formerly tidal areas, marshlands, and sloughs adjacent to the historical San Antonio Channel, now known as the Oakland Inner Harbor. During the late 1800s the eastern portion of the base was used for industrial purposes, specifically the Pacific Coast Oil Company operated a refinery along the western shore of the island. The U.S. Department of the Army (Army) acquired the installation property from the City of Alameda in 1930 and began construction activities in 1931. In 1936, the Navy acquired title to the land from the Army and began building the air station in response to the military buildup in Europe before World War II. Construction of the base included several iterations of filling the existing tidelands, marshlands, and sloughs with dredge materials from the San Francisco Bay (Tetra Tech EM, Inc. [Tetra Tech] 1998).

Following the end of the war in 1945, the installation continued its primary mission of providing facilities and support for fleet aviation activities. During its operations as an active naval base, the installation provided berthing for Pacific Fleet ships and was a major center of naval aviation. Regulatory history, location of OU-2A sites, site descriptions, and future land use are presented in the following subsections.

3.1 REGULATORY HISTORY

The Navy began site investigations at Alameda Point under the Navy Assessment and Control of Installation Pollutants (NACIP) program in 1982. On June 6, 1988, the Navy received a Remedial Action Order from the California Department of Health Services (now the DTSC) that identified a total of 20 sites, which included the five OU-2A sites, as needing an RI/FS in conformance with the requirements of CERCLA. In 1988, the Navy converted its NACIP program into the Installation Restoration Program to be more consistent with CERCLA. Alameda Point was identified for closure in September 1993, and all naval operations ceased in April 1997. In July 1999, Alameda Point was identified as a National Priority List site (EPA 1999a). The Navy is currently conducting an investigation in accordance with CERCLA (EPA 1988) at 28 CERCLA sites. As a management tool to accelerate site investigation, cleanup, and reuse, the Base Realignment and Closure (BRAC) Cleanup Team (BCT) at Alameda Point developed a comprehensive OU strategy that separates the 29 of the 34 CERCLA sites into a total of 10 OUs (OU-1, OU-2A, OU-2B, OU-2C, OU-3, OU-4A, OU-4B, OU-4C, OU-5, and OU-6). Sites 9, 13, 19, 22, and 23 were designated as OU-2A sites because they are adjoined and have high reuse potential.

3.2 LOCATION OF OPERABLE UNIT 2A

Alameda Point is located at the west end of Alameda Island, which lies at the base of a gently westward-sloping plain that extends from the Oakland-Berkeley hills on the east to the shore of the San Francisco Bay on the west. The San Francisco Bay also borders the island to the south and the Oakland Inner Harbor borders the island to the north. The base, rectangular in shape, is approximately 2 miles long and 1 mile wide. Approximately 1,526 acres of Alameda Point is above water, and 1,108 acres is below water in lagoons and harbor areas. OU-2A is located on the southeastern portion of the Alameda Point facility (see Figure H.3-1).

3.3 DESCRIPTION OF SITES WITHIN OPERABLE UNIT 2A

The five sites (Sites 9, 13, 19, 22, and 23) that comprise OU-2A are described in the following text.

3.3.1 Site 9 Description

Site 9 covers approximately 2.9 acres in the western corner of OU-2A (see Figure H.3-2). Two buildings (Buildings 410 and 351) that occupy approximately 37,000 square feet are currently located on Site 9 (see Section 5 of the RI report for details). Building 410 was constructed in 1958 as an aircraft paint stripping facility run by Naval Area Rework Facility (NARF). Building 351, located immediately north of Building 410, was a corrosion control facility. Both buildings are inactive and scheduled for demolition. Industrial Waste Treatment Plant 410, known as Structure 588, was located east of Building 351 and treated paint stripping wastes under a Resource Conservation Recovery Act (RCRA) permit. This facility and 11 associated aboveground storage tanks (AST) have been removed from Site 9.

AST 410A held 10,000 gallons of methylene chloride. AST 410B held 10,000 gallons of phenol, and AST 410C held 1,500 gallons of surfactant. The remaining eight ASTs, known collectively as AST 588, were directly associated with the industrial waste treatment processes conducted there. Acids, bases, coagulants, and other ITWP-related chemicals were stored in these tanks until their removal. There is no historical evidence indicating that underground storage tanks (UST) were ever located at Site 9.

3.3.2 Site 13 Description

An oil refinery operated at the location of Site 13 before Navy operations at Alameda Point (see Figure H.3-2). Site 13 covers approximately 17.5 acres in the northern half of OU-2A (see Section 6 of the RI report for details). Building 397 is a 17,400-square-foot aircraft overhaul plant and engine test facility constructed in 1958 and operated by NARF. A self-storage facility occupies the southeastern corner of the site. The majority of the rest of the site is paved open space.

Five ASTs (324 through 328) of unknown capacity were removed in 1990. These tanks held fuel and were located on the eastern portion of the site. There is no historical record of USTs at Site 13. In addition, two oil water separators and a waste generator accumulation point (GAP), GAP 62, were all operated by the Naval Air Depot (NADEP) at Site 13.

3.3.3 Site 19 Description

Site 19 covers approximately 2.3 acres in the northwestern corner of OU-2A (see Figure H.3-2). There are two structures on the site, Building 616 and Yard D-13 (see Section 7 of the RI report for details). Building 616 is a 1,800-square-foot office and materials storage unit constructed in 1982. Yard D-13 is a 30,000-square-foot hazardous waste storage area with a steel roof and secondary containment berms.

Two USTs, 616-1 and 616-2, (5,000- and 10,000-gallon capacities, respectively) are located at Site 19. The tanks were constructed for spill control but have never been used and have exempt status. There is no historical record of ASTs at Site 19. In addition, Building 616 contains a permitted solid waste management unit (SWMU), SWMU-616, and Yard D-13 also contains a SWMU (SWMU IR-22).

3.3.4 Site 22 Description

Site 22 covers approximately 2.1 acres in the northwestern corner of OU-2A (see Figure H.3-2). This site was formerly a gasoline distribution and service station (see Section 8 of the RI report for details). All buildings associated with the service station (Building 547, 547A, and Structure 547) have been demolished. Three USTs (547-1 through 547-3) associated with the service station were removed. These tanks each held 12,000 gallons of gasoline. The USTs were identified as UST(R)-17 in the RCRA facility assessment. There is no historical evidence of ASTs at Site 22.

3.3.5 Site 23 Description

Site 23 covers approximately 14.3 acres of the southern half of OU-2A (see Figure H.3-2). The main structure located at Site 23 is Building 530 (see Section 9 of the RI report for details). Building 530 was historically the missile rework operations building operated by NARF. Two smaller buildings on the site, Buildings 529 and 600, provided operational support for Building 530. The eastern third of the site currently is used as a self-storage facility.

Three ASTs have been removed from Site 23. ASTs 530A and 530 B each had a capacity of 10,000 gallons. AST 530C was a 15,000-gallon jet fuel tank. These ASTs were associated with a degassing facility that also has been removed. There is no historical evidence of USTs at Site 23. Within Building 530, three GAPs were used to manage solid waste generated by the operations on the building, NADEP GAP 64 (SWMU-48), NADEP GAP 63 (SWMU-46), and NADEP GAP 63A (SWMU-47).

3.4 FUTURE LAND USE FOR SITES WITHIN OPERABLE UNIT 2A

The five sites that comprise OU-2A (Sites 9, 13, 19, 22, and 23) are located in the southeastern portion of Alameda Point (see Figure H.3-2). The planned reuse of these sites, as shown on Figure H.3-3, was determined by the Alameda Reuse and Redevelopment Authority (ARRA) (EDAW Inc. [EDAW] 1996) in their "NAS Alameda Community Reuse Plan" adopted January 31, 1996. Under that reuse plan Alameda Point was divided into the following seven geographical land use areas:

- Civic Core
- Main Street Neighborhoods
- Inner Harbor
- North Waterfront
- Marina District
- Northwest Territories
- Wildlife Refuge

According to the reuse plan (EDAW 1996), Sites 9, 13, 19, 22, and 23 are included in the Inner Harbor land use area (see Figure H.3-3). The Inner Harbor area is located in the southeastern corner of Alameda Point. It is bordered by Breakwater Beach of the San Francisco Bay on the south, noninstallation land uses on the east, the Civic Core of the installation on the north, and the Marina District of the installation on the west.

Redevelopment of the Inner Harbor area is planned to consist of a combination of industrial, open space, and community support land uses. OU-2A is planned for mixed use including: research and development (R&D), light industrial, supporting retail, office, commercial, and residential redevelopment. Community-oriented institutions such as places or worship and nonprofit organizations are also considered allowable and desirable uses. These descriptions were used to guide selection of receptors, emphasizing the major intended reuse as described by ARRA (EDAW 1996).

4.0 DATA SELECTION AND METHODS FOR IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

Evaluating site-specific data is the first step in determining chemicals of potential concern for the HHRA. Soil, soil gas, and groundwater sampling data were collected within and near the sites through several sampling efforts. These data, collected from 1990 to 2003, are summarized in Section 3 of the RI report and were used to characterize the sites.

4.1 DATA REDUCTION RULES

In general, the data were collected and analyzed in accordance with EPA's Contract Laboratory Program (CLP) procedures, and detection limits (sample quantitation limits [SQL]) were sufficiently low to permit identification of potential health risks. Independent reviewers validated all data used in this HHRA and assigned data qualifiers with respect to laboratory blanks and quality control samples. Samples were analyzed for inorganic chemicals, semivolatile organic chemicals (SVOC), volatile organic chemicals (VOC), pesticides, polychlorinated biphenyls, and dioxins. Chromium speciation also was performed. Section 3 of the RI report describes the results of the sampling and analysis.

4.1.1 Reduction of Data: Quality

The results of the data validation process are documented in quality control summary reports maintained by the Navy; all data are presented in Appendix E of the RI report. Data quality assessment and sampling and analysis are described in detail in Section 3 of the RI report.

All data without qualifiers and all data qualified as estimated (J) were used in the HHRA. Data qualified as not detected (U) were incorporated into the HHRA by using a proxy concentration of either one-half of the sample quantitation limit (EPA 1989) or a random value determined using stochastic modeling, consistent with EPA directives (2002d), as described in Section 5.3. Consistent with EPA guidance, only data qualified as rejected were considered unusable for risk assessment purposes (EPA 1989, 1992a). Only validated data sets for soil, groundwater, and soil gas were used in the HHRA for the OU-2A sites; no data that were rejected (R-qualified) by the laboratory or the independent data validator were used in the HHRA.

4.1.2 Reduction of Data: Data Quality Objectives

Site-specific data must meet minimum quality criteria to be used in the HHRAs. In general, field data, screening-level data, and data collected to characterize the sewer system or oil-water separators are not used in the HHRAs. In some site-specific cases, certain data that are normally considered to be "field" or "screening-level" data (such as organic direct-push groundwater grab samples) may have been considered for inclusion where permanent monitoring well data are lacking.

In general, only data collected under the RI program with the objective of characterizing CERCLA activities were used in the HHRA, as the data quality objectives (DQO) set before the RI ensured the data's usability for risk assessment. Pilot-scale treatability study data were not included in the HHRA data set because these data represent conditions in flux during the evaluation of a treatment technology and are not representative of site conditions. Similarly, corrective action site data collected to assess total petroleum hydrocarbon (TPH) program objectives were not included in the HHRA data set (see Appendix F of the RI report), as detailed on a site-specific basis in Section 4.2.

Although some data collected under the environmental baseline survey (EBS) program were validated, the DQOs for the EBS were typically of a screening level (see Section 3.4.2 of the RI report). For this reason, data collected as part of the EBS generally were excluded from the HHRAs at Alameda Point. EBS samples included in the HHRAs met the criteria presented previously and were collected with the objective of characterizing CERCLA activities.

4.1.3 Reduction of Data: Duplicate Data

Where duplicate analyses were collected to assess laboratory precision, only the original sample result was retained in the HHRA data set. This ensured that replicate measurements of the same spatial location were not included in the statistical analyses and risk calculations. In review of the OU-2A data sets used in the HHRA, this procedure streamlined the statistical evaluations. Overall, no significant precision problems were identified in the HHRA data sets.

4.1.4 Reduction of Data: Temporal Scales

For soil, all Level III data that met established DQOs (see Section 3 of the RI report) were used in the COPC screen. This was done to ensure that the process did not eliminate any analytes that may have historically impacted the site. This approach is conservative because it does not account for the natural attenuation of organic compounds, remedial activities to remove potential sources, and/or other processes that tend to decrease concentrations over time such as migration and/or dispersion of groundwater. Although this approach may be appropriate for the COPC screen, where the goal is to identify analytes that may be of potential concern, including historical data in the risk assessment may not be appropriate for evaluating some exposure scenarios.

For vapor intrusion from groundwater, historical data were evaluated for site-specific (and plume-specific as well as chemical-specific) trends. To ensure representative groundwater concentrations, the temporal scale for the groundwater HHRA was prioritized to the most recent groundwater data (for example, from the most recent four quarters) so long as it fully defined the nature and extent (including the temporal extent associated with seasonality) and was representative of a steady-state or declining concentration plume. Otherwise, the use of historical data may not be representative of present-day concentrations and may bias the modeled concentrations (that is, EPC) higher than actual future exposure (see Section 5.3). When this occurred, use of the higher concentration (but more dated) data (including some validated hydropunch data) was necessary to ensure that the EPC was conservative.

4.2 MEDIUM-SPECIFIC DATA REDUCTION: OPERABLE UNIT 2A SOIL

The site boundaries were used to define the soil exposure areas for Sites 9, 13, 19, 22, and 23 for the HHRA because the sites are all relatively small. Soil data for each site were aggregated in depth intervals of 0 to 2 feet below ground surface (bgs) for all four groups of receptors (residents, construction workers, and commercial/industrial receptors) and 0 to 8 feet bgs for construction workers and future residents. While the DTSC standard depth interval of 0 to

10 feet bgs is typically evaluated for residential and construction worker receptors, the groundwater table exists shallower than about 8 feet bgs throughout Alameda Point. The average depth to water for the June 2002 groundwater sampling event at OU-2A was 5.22 feet bgs; the average depth to water during the September 2002 groundwater monitoring event (based on gauging of six wells) on OU-2A was 6.48 feet bgs. Subsurface soils are, therefore, characterized and evaluated only to a depth of 8 feet bgs, as deeper soil depths are consistently below the water table at Alameda Point (Tetra Tech 2001c). Where site-specific overlap of the bottom depth occurred, best professional judgment was used to determine whether the termination depth sample was representative of the intended vertical exposure area, as explained in the following text. Specifically, where a sample started at a depth between land surface and 8 feet bgs, but terminated at 8.25 or 8.5 feet, for example, it was included in the 0 to 8 feet bgs data set. As an example, however, samples from 8.5 to 9 feet bgs (lying wholly beneath the 8-foot depth cutoff) were not included in the data set for 0 to 8 feet bgs. All soil sample locations are shown on Figures H.4-1 through H.4-5.

Because some historical data for PAH at all OU-2A sites at Alameda Point were observed to have elevated detection limits, historic PAH data were excluded from the RI and HHRA by agency agreement. Instead, additional PAH sampling of the CERCLA sites was conducted in the summer of 2003. Because these PAH data achieved detection limits that meet the DQOs for the RIs (that is, detection limits below EPA Region IX preliminary remediation goals [PRG]; see EPA 2002b), the HHRAs rely upon the low-detection limit PAH data rather than historic data. The new PAH data meet all data usability requirements. All soil sample locations are shown on Figures H.4-1 through H.4-5.

As noted previously in Section 4.1.2.1, data collected pursuant to corrective actions under the TPH program were not included in the HHRA data set because they focus on petroleum hydrocarbon contamination. In addition, much of the corrective action data were collected in areas that were contaminated with a nonaqueous phase layer (NAPL), and/or product sheen. These data are problematic for risk assessment because they represent a "hot spot" of saturated soil that acts as a continuing source of contamination instead of site-wide baseline conditions. Because all of the corrective action samples are being addressed via remediation under the corrective action program and an FS is underway to determine the remediation technology selected for the various sites at OU-2A, these hot spot data are not included in the HHRA. Please see Section 3 of the RI report for further details.

4.3 SITE-SPECIFIC GROUNDWATER DATA REDUCTION

The site boundaries were used to define the groundwater exposure areas for Sites 9, 13, 19, 22, and 23 for the HHRA to evaluate exposure on a site-specific basis. As described in Section 3.6 of the RI report, only groundwater data that fully define the nature and extent (including the temporal fluctuations associated with seasonality) were used so that the evaluation is more precise and uncertainty is reduced (see Section 8.2). The following text explains the details of the groundwater data reduction process for each site evaluated in the OU-2A HHRA. Attachment H5 provides the specific list of groundwater samples and associated information for validated data that were used in this HHRA. Figures H.4-6 through H.4-10, which indicate the

distribution of groundwater sampling locations used in the HHRA that are outside the source groundwater areas, are discussed further in the following text.

Only data collected under the Installation Restoration Program with the objective of characterizing CERCLA activities were used in the HHRAs. Field data and screening-level data typically were not used in the HHRAs; however, in some site-specific cases, direct-push groundwater grab samples were included, where permanent monitoring well data are lacking. Direct-push groundwater data were used, when necessary, because a lack of monitoring well data in the concentrated plume areas may result in a data set that does not represent "reasonable maximum" conditions. When possible, at least four quarters of groundwater data were used; trend analyses of historic data was completed to assess the appropriate data set that accounts for seasonal variability as well as most accurately characterizes the plume.

Grab groundwater samples from hydropunch or direct push samples were included to assist in characterizing site risk associated with past releases of VOCs, metals, and SVOCs. Although hydropunch and direct push samples were collected in accordance with accepted protocol, the presence of nonsoluble PAHs in grab groundwater samples may reflect problems inherent with grab groundwater sampling such as inclusion of soil particles in the sample aliquot. In addition, samples collected from wells that contained NAPL were not included for risk assessment; source material cannot be evaluated in the risk assessment but is subject to remedial action.

Samples collected from the second water-bearing zone (SWBZ) also were excluded from the risk assessment data set. The water in the SWBZ is contained or partially contained by the Bay Sediment Unit (BSU), is considered Class III groundwater, is not a potential source of drinking water, and is of limited beneficial use. EPA classifies groundwater having an existing or potential use as a drinking water supply (Class I or II) using the following criteria: a total dissolved solids (TDS) concentration less than 10,000 milligrams per liter (mg/L) and a minimum well yield of 150 gallons per day. Under California State Water Resources Control Board (SWRCB) Resolution No. 88-63 (SWRCB 1988), all groundwater is considered potentially suitable for municipal or domestic supply, unless the TDS content exceeds 3,000 mg/L or a well cannot provide a sustainable yield of 200 gallons per day. The state identifies other potential beneficial uses of groundwater, including industrial service and industrial supply, agricultural supply, and freshwater replenishment (RWQCB 1995). For the purposes of CERCLA response actions, EPA's guidelines are used to classify groundwater because (1) EPA guidelines for TDS and well yield are more conservative than state criteria and (2) the State of California does not have an EPA-approved comprehensive state groundwater protection plan. Conductivities in the first water-bearing zone (FWBZ) ranged from 2,600 to 37,000 micromhos per centimeter (µmhos/cm). The highest conductivities were measured in wells in the SWBZ at the southern and western edges of OU-2A, including 20,000 µmhos/cm at D19-01, 34,000 µmhos/cm at D10B-01, and 37,000 µmhos/cm at D09-01. These monitoring well locations are closest to the coast; the higher conductivities may indicate the location of the top of the salt water-fresh water interface. These wells are in the SWBZ. Finally, with the exceptions noted in Sections 4.3.1 through 4.3.5, all the following RI data were considered in the HHRA: well data, hydropunch data, direct push, and geoprobe data. Groundwater data included in the HHRA is tabulated by site in Attachment Tables H5-1 through H5-5.

4.3.1 Site 9 Groundwater

Site 9 was impacted by releases of chlorinated hydrocarbons, naphthalene, and halogenated hydrocarbons from historic paint stripping activities inside of Building 410. The groundwater plume at Site 9 was defined by the extent of the largest plume (1,1-dichloroethane [DCA]) as discussed in Section 5.4 of the RI. Sampling locations used in the OU-2A HHRA for Site 9 are shown on Figure H.4-6.

The groundwater monitoring well network at Site 9 typically defines the edge of the contamination plumes, with the exception of MW410-2, which is within the plume. The highest concentrations of many of the chlorinated hydrocarbons are beneath the building and coincident with storm and industrial wastewater conveyance pipes located east of Building 410. No wells are located in this area; therefore, to approximate reasonable maximum exposure (RME) groundwater concentrations in the absence of monitoring well data, validated grab groundwater data collected in the area were considered appropriate for characterizing risk. These points were considered because they were located near the suspected source of the chlorinated hydrocarbon release. They were also analyzed for metals and PAHs. In addition, several grab groundwater points west of Building 410 were considered appropriate for risk characterization based on the lack of wells in the area and the presence of breakdown chlorinated hydrocarbons. Validated data from the following points were eliminated from the risk assessment because they were not representative of current RME conditions in the aquifer, as explained in the following text:

- **DHP-S09-01** – This hydropunch grab groundwater sample was advanced in 1994. It is located adjacent to MW410-1 (screened between 5 and 15 feet bgs). The depth of the grab groundwater sample is 25 feet bgs. Both of these sampling points are located downgradient, along industrial waste/storm sewer lines that are the suspected former source of groundwater contamination. The well and the hydropunch sample location are cross gradient and over 100 feet from the former source area. The adjacent well is more representative of groundwater conditions at the site.

- **3-J** – This sample was collected from a storm drain or manhole. It is not representative of groundwater conditions.

- **D09-01** – This well is screened in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **DHP-S09-02** – This sample was collected in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **S09-DGS-DP03** – Validated samples from this point were collected in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **S09-DGS-DP07** – Validated samples from this point were collected in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **S09-DGS-DP08** – Validated samples from this point were collected in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **S09-DGS-VE-01** – This point was collected using vacuum excavation methods to evaluate whether storm drain bedding was acting as a preferential pathway. The sample collection may have impacted the concentrations of VOCs present in groundwater, and the point was not included in the risk assessment data set.

- **S09-DGS-DP11** – Validated samples from this point were collected in the SWBZ and were not included in the risk assessment data set.

Based on the evaluation in Section 5.4 of the RI, the remaining groundwater data set (see Table H5-1 of Attachment H5) were selected to represent reasonable maximum representative concentrations at Site 9.

4.3.2 Site 13 Groundwater

As noted in Section 4.2, corrective action site data collected to assess TPH program objectives were not included in the HHRA data set because the DQOs did not ensure usability of the data for risk assessment. The majority of the corrective action site data were collected to define nature and extent of a known release on Site 13, as described in Section 6.4 of the RI report. As a result, the majority of the corrective action program data were not "Level III" validation data suitable for risk assessment. Sampling locations used in the OU-2A HHRA for Site 13 are shown on Figure H.4-7.

A specific additional concern (in addition to the lack of validation for the majority of analyses) where corrective action soil and groundwater data were collected is that the data represent saturated soils and groundwater with product sheen. Specifically, the analyses collected as part of the corrective action groundwater sampling included a nonaqueous layer (see Section 6.2 of the RI report for details). These data are problematic for risk assessment because they are not representative of site-wide baseline conditions but rather represent a "hot spot" of contamination. Because all of the corrective action samples are being addressed through remediation under the corrective action program and an FS is underway to determine the exact method for remediation, these hot spot data are not included in the HHRA.

This site was impacted by the release of tarry refinery wastes from the historic oil refinery that operated at the site. In addition, releases of petroleum hydrocarbon fuels have been documented around Building 397 and suspected in the eastern portion of the site near former ASTs. The presence of NAPL in wells near Building 397 and in the southeast portion of the site, sporadic nature of monitoring well and grab groundwater sample coverage, and the presence of several

spurious compounds in groundwater made data selection for this site challenging. Site 13 risk was evaluated on a site basis based on these concerns:

- **DHP-S13-02**– This hydropunch grab groundwater sample was collected in 1994 at 18 feet bgs. The hydropunch point was located adjacent to MWOR-3, which is screened from 5 to 15 feet bgs. The well has been sampled periodically (as recently as 2001) and is more representative of current groundwater conditions at the site than the grab 1994 hydropunch data.

- **DHP-S13-03** – This hydropunch grab groundwater sample was collected in 1994 at 22 feet bgs. The hydropunch point was located adjacent to M13-08, which is screened from 22 to 30 feet bgs. The well has been sampled periodically (including recent 2001 and 2002 sampling events) and is more representative of current groundwater conditions at the site than the grab 1994 hydropunch data.

- **S13-DGS-VE01 through VE03** – These points were collected using vacuum excavation methods to evaluate whether storm drain bedding was acting as a preferential pathway. The sample collection may have impacted the concentrations of volatile organic compounds present in groundwater and the point was not included in the risk assessment data set assessment.

- **B13-29 and B13-28** – Because these samples were collected from an area that has NAPL, they are not acceptable for risk assessment.

- **CA13-02, 04, 05, CAA13-02-11 through 26** – These points were collected as part of TPH investigations and do not focus on CERCLA issues. In addition, many of these samples were collected from points that contained NAPL.

Based on the evaluation in Section 6.4 of the RI, the remaining groundwater data set (see Table H5-2 of Attachment H5) was selected to represent reasonable maximum representative concentrations at Site 13.

4.3.3 Site 19 Groundwater

Site 19 was the hazardous material storage unit and is impacted with waste VOCs that may have leaked during transfer or storage at the site. Site 19 is a relatively small with sporadic, low concentrations of VOCs; therefore, the site boundaries were used to define the exposure area for groundwater, as discussed in Section 7.3 of the RI. Sampling locations used in the OU-2A HHRA for Site 19 are shown on Figure H.4-8.

- **DHP-S19-01** – This hydropunch grab groundwater sample was advanced in 1994. It is located adjacent to MWD13-1 (which is screened between 5 and 15 feet bgs). The depth of the grab groundwater sample is 19 feet bgs. The well has detectable concentrations of 1,1-DCA, and the hydropunch sample is below detection values for all constituents. The hydropunch sample depth is close enough to the screened

interval that it adds no value. The adjacent monitoring well was thus more representative of groundwater conditions at the site.

- **DHP-S19-03** – This hydropunch grab groundwater sample was collected in 1994. It is located approximately 20 feet from MWD13-3 (screened between 5 and 15 feet bgs). The depth of the grab groundwater sample is 20.5 feet bgs. The well has detectable concentrations of tetrachloroethene (PCE) and 1,1-DCA, and the hydropunch sample is below detection values for all constituents. The hydropunch sampling location and depth are close enough to the screened interval of the well that the sample adds no value. The adjacent well was found to be more representative of groundwater conditions at the site.

- **D19-01** – This well is screened in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **DHP-S19-01** – Validated samples from this point were collected in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **SHP-S19-01 through SHP-S19-03** – These samples were only analyzed for total petroleum hydrocarbons and are not appropriate for consideration in this risk assessment.

- **DHP-S19-03** – Validated samples from this point were collected in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **DHP-S19-05** – Validated samples from this point were collected in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

Based on the evaluation in Section 7.3 of the RI, the remaining groundwater data set (see Table H5-3 of Attachment H5) was selected to represent reasonable maximum representative concentrations at Site 19.

4.3.4 Site 22 Groundwater

Site 22 is the former gasoline service station also known as CAA-4C. The facility had a fuel island, a car wash, and parking areas. The site was impacted by releases of petroleum products from underground storage tanks and associated refueling equipment. This was a specific concern where soil and groundwater data represent saturated soils and groundwater with product sheen (that is, a nonaqueous layer). These data are problematic for risk assessment because they are not representative of site-wide baseline conditions but rather represent a "hot spot" of contamination. Because these samples are being addressed via remediation under the corrective action program and an FS is underway to determine the exact method for remediation, these hot

spot data are not included in the HHRA. Nevertheless, the groundwater plume at Site 22 was defined by the extent of the largest plume (benzene), as discussed in Section 8.4 of the RI. Sampling locations used in the OU-2A HHRA for Site 22 are shown on Figure H.4-9.

- **DHP-S07C-01** – This hydropunch grab groundwater sample was advanced in 1994. It is located adjacent to MW547-1 (screened between 5 and 15 feet bgs). The hydropunch sample was collected at 22.5 feet bgs. The hydropunch sampling location and depth are close enough to the screened interval of the well that the sample adds no value. The adjacent well is more representative of current groundwater conditions at the site.

- **DHP-S07C-02** – This hydropunch grab groundwater sample was advanced in 1994. It is located adjacent to MW547-2 (screened between 5 and 15 feet bgs). The hydropunch sample was collected at 21 feet bgs. The hydropunch sampling location and depth are close enough to the screened interval of the well that the sample adds no value. The adjacent well is more representative of current groundwater conditions at the site.

- **DHP-S07C-03** – This hydropunch grab groundwater sample was advanced in 1994. It is located adjacent to MW547-4 (screened between 5 and 15 feet bgs). The hydropunch sample was collected at 26 feet bgs. The hydropunch sampling location and depth are close enough to the screened interval of the well that the sample adds no value. The adjacent well is more representative of current groundwater conditions at the site.

- **DHP-S07C-04** – This hydropunch grab groundwater sample was advanced in 1994. It is located adjacent to MW547-5 (screened between 5 and 15 feet bgs) and D07C-01 (screened between 49 and 59 feet bgs). The hydropunch sample was collected at 16 feet bgs. The hydropunch sampling location and depth are close enough to the screened interval of well MW547-5 that the sample adds no value. The adjacent well is more representative of current groundwater conditions at the site.

- **CAA4C-DGS-PZ01** – These samples were collected from points that contained NAPL, which is being addressed as a source under the corrective action program.

- **CAA4C-DGS-DP01** – These samples were collected from points that contained NAPL, which is being addressed as a source under the corrective action program.

Based on the evaluation in Section 8.4 of the RI, the remaining groundwater data set (see Table H5-4 of Attachment H5) was selected to represent reasonable maximum representative concentrations at Site 22.

4.3.5 Site 23 Groundwater

Site 23 was used historically as a plane defueling and missile rework facility (Building 530). The site is impacted with petroleum hydrocarbons and petroleum associated compounds from releases of fuel during the historic plane defueling activity. Several grab groundwater samples were collected from the area around Building 530. No wells are located in this area, and validated grab groundwater data collected in the area were considered appropriate for characterizing risk. Although these points were considered because they were located near the suspected source of the release, they were analyzed for metals and PAHs. This was a specific concern where soil and groundwater data were collected that may represent saturated soils and groundwater with product sheen (that is, a nonaqueous layer). These data are problematic for risk assessment because they are not representative of site-wide baseline conditions but rather represent a "hot spot" of contamination. These areas are being addressed via remediation under the corrective action program, and an FS is underway to determine the exact method for remediation; therefore, these hot spot data are not included in the HHRA. Sampling locations used in the OU-2A HHRA for Site 23 are shown on Figure H.4-10.

- **5-JF** – This sample was collected from a storm drain or manhole. It is not representative of groundwater conditions.

- **DHP-S10B-01** – This hydropunch grab groundwater sample was advanced in 1994. It is located adjacent to M10B-01 (screened between 3 and 11 feet bgs) and D10B-02 (screened between 50 and 60 feet bgs). The hydropunch sample was collected at 40 feet bgs. The hydropunch sampling location and depth are close enough to the screened interval of well D10B-02 that the sample adds no value. The adjacent well is more representative of current groundwater conditions at the site.

- **DHP-S10B-03** – This hydropunch grab groundwater sample was advanced in 1994. It is located adjacent to MW530-3 (screened between 5 and 15 feet bgs). The depth of the grab groundwater sample is 24 feet bgs. The hydropunch sampling location and depth are close enough to the screened interval of well MW530-3 that the sample adds no value. The adjacent well is more representative of current groundwater conditions at the site.

- **DHP-S09-04** – This hydropunch grab groundwater sample was advanced in 1994. It is located adjacent to MW410-4 (screened between 5 and 15 feet bgs). The depth of the grab groundwater sample is 22 feet bgs. The hydropunch sampling location and depth are close enough to the screened interval of well D10B-02 that the sample adds no value. The adjacent well is more representative of current groundwater conditions at the site.

- **DHP-S13-05** – This hydropunch grab groundwater sample was advanced in 1994. It is located adjacent to MWOR-5 (screened between 5 and 15 feet bgs). The depth of the grab groundwater sample is 13.5-17 feet bgs. The hydropunch sampling location and depth are close enough to the screened interval of well MWOR-5 that the sample

adds no value. The adjacent well is more representative of current groundwater conditions at the site.

- **S23-DGS-VE01 and VE02**– This point was collected using vacuum excavation methods to evaluate whether storm drain bedding was acting as a preferential pathway. The sample collection may have impacted the concentrations of VOCs present in groundwater, and the point was not included in the risk assessment data set.

- **D10B-02** – This well is screened in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **DHP-S10B-02** – Validated samples from this point were collected in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **DHP-S10B-05** – Validated samples from this point were collected in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **DHP-S10B-04** – Validated samples from this point were collected in the SWBZ. Samples from the SWBZ were excluded from the risk assessment data set (see Section 4.3).

- **CA13-07 through CAA13-10** – These points were collected as part of TPH investigations and do not meet the DQOs for the CERCLA RI.

Based on the evaluation in Section 9.4 of the RI, the remaining groundwater data set (see Table H5-5 of Attachment H5) was selected to represent reasonable maximum representative concentrations at Site 23.

4.4 SITE-SPECIFIC SOIL GAS DATA REDUCTION

Soil gas data are used in the evaluation of subsurface vapor migration pathways; however, the availability of soil gas data generally is limited for the sites that comprise OU-2A. Soil gas data was collected after consultation with the BCT at points expected to be over the highest concentrations of volatile organic compounds present in groundwater. This sampling design was anticipated to produce the highest concentrations of volatile organic compounds in soil gas for use in the HHRA. As a result, soil gas data generally are used in the HHRA for each site to complement groundwater data and to provide a "weight of evidence" basis for risks calculated for pathways related to subsurface vapor intrusion. All available soil gas data were used for the sites that comprise OU-2A. Where probes were used in the collection or samples were collected from multiple depths, each measurement was considered a discrete measurement for purposes of tabulating the summary statistics and screening for soil gas COPCs.

4.5 CHEMICALS OF POTENTIAL CONCERN SELECTION RATIONALE

As mandated in RAGS Part D (EPA 2001c) and suggested in Navy tiered guidance (Navy 2001), COPCs were selected for surface soil, subsurface soil, groundwater through direct contact, groundwater via vapor intrusion, and soil gas. COPCs are the subset of chemicals at a site that are most likely to present a potential health risk. Chemicals were selected as COPCs using the following screening criteria: (1) essential nutrient status (Section 4.5.1); (2) comparison with risk-based screening criteria (Section 4.5.2); and (3) frequency of detection (Section 4.5.3). Further, a separate discussion of chemicals below ambient "background" concentrations is provided to risk managers to understand the contribution of background inorganic compounds to a receptor's incremental risk (Section 4.5.4).

4.5.1 Essential Nutrient Status

According to EPA guidance (1989), the following essential human nutrients are to be excluded as COPCs: calcium, iron, magnesium, potassium, and sodium. Even if these chemicals are present at concentrations above naturally occurring levels, they are eliminated as COPCs because they are toxic at only very high doses. Neither EPA's IRIS, an on-line database that contains EPA-approved reference doses (RfD) and cancer slope factors (SF) (EPA 2003a), nor DTSC recommends toxicity values for these chemicals. It is unlikely that environmental exposures to essential nutrients would result in toxic effects to potential receptors.

4.5.2 Risk-Based Screening Criteria

The maximum detected chemical concentration in surface soil, subsurface soil, groundwater via direct contact, groundwater via vapor intrusion, and soil gas were compared to risk-based screening criteria to determine whether the analyte warranted inclusion as a COPC.

4.5.2.1 Surface and Subsurface Soil

PRGs are risk-based concentrations that correspond to a cancer risk of 1×10^{-6} or a hazard quotient (HQ) of 1 based on standardized equations that combine standard exposure assumptions and EPA or Cal-modified EPA toxicity values (see Section 8 for a discussion of toxicity values). The following exposure pathways are incorporated into the PRGs for soil: incidental ingestion, dermal contact, and inhalation of airborne particles and VOCs released from soil to ambient (outdoor) air. PRGs are currently available for a resident and an industrial/commercial worker. The residential PRG is more conservative (that is, lower) than the industrial PRG because it accounts for childhood exposures. Children are considered more sensitive to chemicals than adults. The risk estimates developed using PRGs represent the risk for all exposure pathways evaluated within the PRG framework.

Consistent with EPA (EPA 1989) and Navy guidance (Navy 2001), compounds with maximum detected concentrations less than Region IX residential PRGs (or Cal-modified PRGs [EPA 2002a]) were eliminated as COPCs for the quantitative evaluation of incremental risk. The

effect of the COPC screen relative to total risk (hereinafter refers to risk from all detected chemicals, regardless of whether measured concentrations are above or below PRGs) is evaluated in Section 8. A compound was considered present below screening levels and eliminated as a COPC if the maximum detected concentration was below the Region IX residential PRG. For those compounds where no Region IX residential PRG was available, a surrogate compound that had a Region IX residential PRG was chosen for screening purposes (see Section 6 for surrogate selection). The COPC selection process produced separate sets of COPCs for surface soils (0- to 2-foot bgs soil depth interval) and subsurface soils (0- to 8-foot bgs soil depth interval) to allow for risk managers to evaluate two future reuse scenarios. The COPC selection process produced separate sets of surface and subsurface soil COPCs for each of the five OU-2A sites (see Section 4.5).

TPH fractions were detected in some soil samples at various depth intervals; however, TPH fractions were not evaluated in the HHRA. As recommended by DTSC, data for specific TPH indicator chemicals (for example, benzene, toluene, ethylbenzene, xylene, and PAH) should be used to assess potential human health risk from TPH contamination (DTSC 1993a). Nonchemical-specific TPH data were excluded from evaluation in the HHRA because they are considered inadequate and insufficient to evaluate risk from TPH contamination.

4.5.2.2 Groundwater via Direct Contact

PRGs are risk-based concentrations developed by EPA Region IX to correspond to a cancer risk of 1×10^{-6} or a HQ of 1 based on standardized equations that combine standard exposure assumptions and EPA toxicity values. Exposure pathways incorporated into the tap water PRGs for groundwater are inhalation of vapors during domestic use and ingestion as a drinking water source. Although the tap water PRGs are based upon a residential exposure scenario, they are considered protective of a commercial/industrial exposure scenario because the residential exposure is likely to be higher. Also, the residential PRG is more conservative (that is, lower) than a hypothetical commercial/industrial PRG because it accounts for childhood exposures and longer total residential exposure durations than for a worker. Children are considered more sensitive to chemicals than adults. The risk estimates developed using PRGs represent the risk for all exposure pathways evaluated within the PRG framework.

Consistent with EPA (EPA 1989) and Navy guidance (Navy 2001), compounds with maximum detected concentrations less than Region IX tap water PRGs (or Cal-modified PRGs [EPA 2002a]) were eliminated as COPCs for the quantitative evaluation of incremental risk. The effect of the COPC screen relative to "total risk" (including risk from all detected chemicals, regardless of whether measured concentrations are above or below PRGs) is evaluated in Section 7. A compound was considered present below screening levels and eliminated as a COPC if the maximum detected concentration was below the Region IX tap water PRG. For those compounds where no Region IX PRG was available, a surrogate compound that had a Region IX tap water PRG was chosen for screening purposes (see Section 6.4 for surrogate selection). The COPC selection process produced separate sets of COPCs for each of the five OU-2A sites (see Section 4.5).

4.5.2.3 Groundwater via Direct Contact and Soil Gas

Groundwater and soil gas were evaluated for potential vapor intrusion because vapors can emanate from the subsurface, where there is the potential for migration upward into indoor air. To establish COPCs for the vapor intrusion pathway, all detected volatile chemicals were subsequently screened in against applicable indoor air screening values. For the purposes of this HHRA, the definition of volatility (Henry's law constant greater than 1×10^{-5} atmosphere-cubic meter per mole and molecular weight less than 200 grams per mole) was adopted from EPA (1991a, 2002a).

Risk-based screening criteria were adopted from Table 2c of the draft "Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)" (EPA 2002c). Table 2c values (EPA 2002c) are based upon very conservative default attenuation factors (0.1 for shallow soil gas and 0.001 for groundwater) that do not incorporate site-specific vapor intrusion parameters such as depth to groundwater or building air exchange rates but ensure that the evaluation is protective of residential exposure (10^{-6} carcinogenic risk level and a hazard index of 1). In some instances, the Table 2c screening levels were truncated as national primary drinking water regulation maximum contaminant levels (MCL) (EPA 2003c); however, these screening levels (not risk-based) were replaced with the actual risk-based screening levels in lieu of MCLs. In several cases, this resulted in the shallow aquifer being screened against risk-based concentrations well below the drinking water MCL. Because the Table 2c subsurface vapor intrusion guidance screening values are intended to be used as an initial screen (EPA 2003c), an additional screening step was conducted for vapor intrusion from groundwater and soil gas (see Section 4.6).

4.5.3 Frequency of Detection

Exclusion of a COPC for a specific medium based on a frequency of detection (FOD) of less than 5 percent was appropriate only if the following criteria were met:

1. At least 20 samples have been collected from that medium.
2. The COPC is not historically related to site operations involving suspected CERCLA releases.
3. The COPC is not a chemical closely related to others detected.
4. Detection limits for some or all analyses for that analyte are not elevated.
5. The contaminant in question is not a degradation product (for example, in the event that the daughter product vinyl chloride is not frequently detected, but a parent chemical, trichloroethene [TCE], is frequently detected in the same media).

The FOD criteria are used because chemicals detected infrequently might be sampling and analytical artifacts or spurious data (EPA 1989). If detection limits were adequate and the

previous criteria were satisfied, chemicals detected at less than a 5 percent frequency were excluded from the HHRAs. At Alameda Point OU-2A, frequency of detection was not used as the sole rationale for exclusion of any COPCs. All maxima also were excluded as being below a risk-based screening toxicity concentration as well (see Tables H-2.1 through 2.24).

4.5.4 Background Comparison

The presence of a contaminant at a concentration lower than the natural background concentration was not used as a criterion for elimination. Consistent with EPA guidance (although in contrast to Navy [2001] guidance) for characterizing human health risks, inorganic compounds below background were retained for a total risk assessment. The risk characterization (Section 7) and uncertainty evaluation (Section 8) assess the contribution of inorganic compounds to total risk on a site-specific basis, and thus, the background comparison was for risk management information only.

The background comparison used at Alameda Point for soils and groundwater consists of detailed parametric and nonparametric tests of mean concentration values for inorganic chemicals. Details of the statistical methodology for the background comparison are presented in Appendix A of the RI report. Data used to screen background concentrations were selected from the appropriate (most similar) background areas (based on fill history) for Alameda (as described in Tetra Tech 2001b). For all of the OU-2A sites, the background comparison was conducted on the "blue" background data set (Tetra Tech 2001b), and results are presented in Appendix A of the RI report. Soil data were aggregated from 0 to 8 feet bgs at each site and statistically compared to the background data using the appropriate test. Concentrations of analytes in groundwater were also compared with basewide background concentrations for descriptive purposes.

4.6 Additional Screen for Subsurface Vapor Intrusion Pathways (Groundwater and Soil Gas)

Methods for evaluating the subsurface vapor intrusion to indoor air exposure pathway have undergone several changes in the last few years and are periodically updated based upon the latest available science. The latest vapor intrusion guidance (EPA 2002c) was used in this evaluation to ensure that the risk assessment is protective of the most sensitive receptor (future on-site resident). Also, instead of relying on a single risk-based screening level to evaluate potential vapors from potential sources, soil gas and groundwater data are evaluated in conjunction with each other on a weight of evidence basis to determine whether the vapor intrusion pathway is of potential concern and warrants further evaluation and/or inclusion in the risk assessment. The process for evaluating the vapor intrusion pathway included the following steps:

- Soil gas and groundwater COPC determination for the vapor intrusion to indoor air pathway

- A Tier 1 evaluation to determine whether recent soil gas and groundwater COPCs exceed conservative risk-based criteria protective of residential exposure and warrant a further Advanced Tier 1 evaluation

- An advanced Tier 1 weight of evidence evaluation to determine whether the vapor intrusion pathway warrants inclusion in the risk assessment

This three-step process is detailed in the following sections.

4.6.1 Soil Gas and Groundwater Determination for the Vapor Intrusion to Indoor Air Pathway

As detailed in Section 4.5.2.3, maximum detected concentrations of soil gas and groundwater were compared to Table 2c values adopted from subsurface vapor intrusion guidance (EPA 2002c). Table 2c values are based upon very conservative default attenuation factors (0.1 for shallow soil gas and 0.001 for groundwater) that do not incorporate site-specific vapor intrusion parameters (for example, depth to groundwater or building air exchange rates) but ensure that the evaluation is protective of residential exposure (10^{-6} carcinogenic risk level and an HI of 1).

In some instances, the risk based screening levels for the vapor intrusion pathway were lower than national primary drinking water regulation MCLs (EPA 2003c), so MCLs were provided as screening levels in Table 2c; however, it was agreed that risk-based screening levels would not be based upon MCLs, so risk-based screening levels were used in lieu of MCLs. These concentrations were calculated as shown in Attachment H1. Also, a few analytes did not have Table 2c values, so screening levels were developed in accordance with Appendix D of the subsurface vapor intrusion guidance (EPA 2002c) and are also presented in Attachment H1.

4.6.2 Tier 1 Evaluation

The Tier 1 evaluation was performed to determine whether soil gas and groundwater COPCs exceed conservative risk-based criteria that incorporate site-specific vapor intrusion parameters (for example, depth to groundwater or building air exchange rates). This Tier 1 evaluation is equivalent to an initial analyte screen (that is, COPC screen) endorsed by the RWQCB in the interim final "Application of Risk-Based Screening Levels and Decision Making to Sites with Impacted Soil and Groundwater" (RWQCB 2001) and is consistent with the subsurface vapor intrusion guidance (EPA 2002c). Tier 1 screening values were adopted from Table F-1 of the RWQCB instructions (RWQCB 2001). Tier 1 screening values are based upon intrusion of vapor into a 961-square-foot, two-story home from shallow groundwater, through coarse, sandy soils. These assumptions are appropriate for future residential exposure at the site because they represent typical residential home parameters and include environmental conditions that are conservative for the site (such as coarse sandy soils). Nevertheless, the RWQCB updated soil gas values in 2003 to include a more conservative exposure scenario (for example, the assumption of one indoor air exchange rate per hour and a one story residential structure). These updated values were established in the "Update to Draft, Interim Soil Gas Screening Levels for

Evaluation of Potential Indoor-Air Impacts" (RWQCB 2003). To ensure that the Tier 1 groundwater evaluation was protective of any potential future residential exposure scenario, adjusted RWQCB groundwater values (Adjusted Tier 1 Values) were calculated to include the changes in exposure parameters and any changes to toxicity values established since the original RWQCB (2001) values. Tier 1 and Adjusted Tier 1 Values are based upon a 10^{-6} carcinogenic risk level and an HI of 0.2.

In addition to the Tier 1 and adjusted Tier 1 soil gas and groundwater screening values presented in Tables H1-1 through H1-5 of Attachment H1, groundwater maxima for the last four quarters (since June 2002) and last eight quarters (since June 2001) are presented to evaluate the most likely future residential exposure scenario. Using only the most recent groundwater data that fully define the nature and extent (including the temporal extent associated with seasonality) are given priority in this evaluation so that the evaluation is more precise and uncertainty is reduced. If the maxima soil gas and groundwater values are less than Tier 1 and Adjusted Tier 1 screening values, then the vapor intrusion pathway for this analyte is not of potential concern. Analytes that exceed Tier 1 and Adjusted Tier 1 screening values warrant a further advanced Tier 1 evaluation.

Absent from this vapor intrusion evaluation are EPA and Cal/EPA MCLs established to protect drinking water sources. MCLs were not used in this evaluation because risk-based screening levels for the vapor intrusion pathway are often lower than MCLs. Also, although MCLs are valuable for determining long-term remedial goals for site groundwater, they are not necessarily pertinent for protecting residential exposure to the vapor intrusion pathway.

4.6.3 Advanced Tier 1 Weight of Evidence Evaluation

An advanced Tier 1 weight of evidence evaluation includes evaluating soil gas and groundwater concentrations in conjunction with the RI DQOs (presented in Section 3.5 of the RI report) and other site data to determine whether the vapor intrusion pathway is of potential concern and should be considered in the HHRA. Because the passive migration of volatiles upward is a potentially complete pathway wherever VOCs are present in groundwater or at high concentrations in subsurface soils, this pathway was considered complete in the HHRA for all OU-2A sites where VOCs were detected in subsurface media. The site-specific evaluation of this pathway is presented in Section 7 for each site.

4.7 CHEMICALS OF POTENTIAL CONCERN SUMMARY

As mandated in RAGS Part D (EPA 2001c) and suggested in Navy tiered guidance (Navy 2001), COPCs were selected for surface soil, subsurface soil, groundwater via direct contact, groundwater via vapor intrusion, and soil gas. All detected constituents are listed in the COPC selection tables (see Tables H.2-1 through H.2-24). The tables present the minimum and maximum detected values, frequency of detection, range of detection limits, background value (as appropriate), concentration used for screening, and results of the COPC selection process.

4.7.1 Chemicals of Potential Concern for Site 9

The COPC selection process for surface soils, subsurface soils, groundwater via domestic use, groundwater via vapor intrusion, and soil gas are detailed in Tables H-2.1 through H-2.5. Because the rationale for determining soil and groundwater COPCs are thoroughly detailed on the referenced tables, additional details are not repeated here to prevent redundancy. Additional details pertaining to the Tier 1 and Advanced Tier I vapor intrusion evaluation are provided in the following text.

4.7.1.1 Indoor Air (Vapor Intrusion from Groundwater and Soil Gas) at Site 9

The following chemicals detected in soil gas (Table H-2.3) were retained as COPCs: 1,1,2-trichloroethane (TCA); benzene; ethylbenzene; and toluene. As previously discussed, the vapor intrusion pathway is based on a Tier 1 evaluation of soil gas COPCs, supplemented by analysis of COPCs for groundwater to provide weight of evidence support to the soil gas values. Chemicals that are determined to warrant more rigorous evaluation during Tier 1 are subsequently analyzed in an advanced Tier I evaluation. The results of Tier 1 and advanced Tier I vapor intrusion analysis for Site 9 are described in the following text and are presented in Table H1-1 of Attachment H1.

4.7.1.2 Tier 1 Evaluation at Site 9

The following analytes were retained as soil gas COPCs for the vapor intrusion to indoor air pathway: 1,1,2-TCA, benzene, ethylbenzene, and toluene. Of these analytes, only 1,1,2-TCA and benzene exceeded Tier 1 screening values and are evaluated in the advanced Tier I evaluation presented in the following text (see Table H1-1 of Attachment H1 and Table H-2.4).

The following analytes were groundwater COPCs for the vapor intrusion to indoor air pathway: 1,2-dichloroethene (DCE) (total), 2-methylnaphthalene, benzene, ethylbenzene, naphthalene, PCE, TCE, and vinyl chloride. Of these analytes, only naphthalene, TCE, and vinyl chloride exceeded Adjusted Tier 1 screening values and are evaluated in the advanced Tier I evaluation presented in the following text (see Table H1-1 of Attachment H1 and Table H-2.4).

4.7.1.3 Advanced Tier I Evaluation at Site 9

Two soil gas analytes (1,1,2-TCA and benzene) and three groundwater analytes (naphthalene, TCE, and vinyl chloride) warranted an advanced Tier I evaluation. These analytes represent two potential waste streams (chlorinated solvents and gasoline range organic hydrocarbons) and are evaluated separately.

Vinyl chloride was detected twice in 1994, with concentrations of 18 and 220 micrograms per liter (µg/L). Since 2001, vinyl chloride has been detected 5 times in one well (MW410-2) at concentrations that ranged from 9.6 to 20 µg/L. Three of the five recently detected concentrations were less than the Tier 1 screening value (11 µg/L); however, concentrations are

generally increasing, with the highest concentration being detected in the latest round of groundwater sampling. The extent of vinyl chloride impacts is very localized, as evidenced by nondetect concentrations in nearby well D09-01. Vinyl chloride was not detected in soil gas samples; however, the minimum detection limit was 32.7 micrograms per cubic meter ($\mu g/m^3$), which is approximately an order of magnitude greater than the subsurface vapor intrusion guidance value (2.8 $\mu g/m^3$) and slightly greater than the Tier 1 screening value (31 $\mu g/m^3$). Based upon this weight of evidence, vinyl chloride is considered an analyte of potential concern for the vapor intrusion pathway.

The presence of TCE has been confirmed in 2 of the 29 samples collected since September 1994, when the maximum concentration of 22 µg/L was collected (see Attachment H1 and Table H-2.4). Both samples were estimated (0.8 J and 0.1 J) well below the Adjusted Tier 1 screening level of 3.4 µg/L. TCE was not detected in either of the soil gas samples, which were collected near the 1994 maximum groundwater location; the maximum reporting limit (72 $\mu g/m^3$) was well below the Tier 1 screening value of 1,200 $\mu g/m^3$, demonstrating that the soil gas sampling was sufficiently sensitive. Based upon this weight of evidence, TCE is not of potential concern for the vapor intrusion pathway and will not be considered further in the risk assessment.

1,1,2-TCA had an identified concentration of 593 $\mu g/m^3$ in the shallow soil gas sample; however the qualifier associated with this sample is "Q," which is defined as "reporting limit raised due to other compounds or matrix effects". The deeper soil gas sample is 69.8 $\mu g/m^3$, which is less than the Tier 1 screening value of 150 $\mu g/m^3$. Also, 1,1,2-TCA was not detected in any of the groundwater samples. Based upon this weight of evidence, 1,1,2-TCA is not of potential concern for the vapor intrusion pathway and was not considered further in the risk assessment.

The presence of naphthalene has been confirmed in 4 of the 32 samples collected since September of 1994, when the maximum concentration of 29,000 µg/L was collected (see Attachment H1 and Table H-2.4). The maximum detected concentration since 1994 was 85 µg/L, which is much less than the adjusted Tier 1 screening value of 2,310 µg/L. Naphthalene was not detected in either of the soil gas samples and both nondetected concentrations (671 and 704 $\mu g/m^3$) were only slightly greater than the Tier 1 screening level of 630 $\mu g/m^3$. The sample containing the maximum value was identified as NAPL in error and omitted from the HHRA screening. Based upon this weight of evidence from the remaining data, naphthalene is not of potential concern for the vapor intrusion pathway and was not considered further in the risk assessment.

Benzene was detected in the shallow soil gas sample at a concentration (1,202 $\mu g/m^3$) an order of magnitude greater than the Tier 1 screening level (84 $\mu g/m^3$). The deeper soil gas sample contained a concentration (approximately 123 $\mu g/m^3$) that was slightly greater than the Tier 1 screening value. The maximum detected concentration of benzene in groundwater is 2 µg/L, which is below the Tier 1 and Adjusted Tier 1 screening levels. Although there is no evidence that a significant source of benzene exists at Site 9, benzene concentrations in the soil gas warrant the consideration of benzene as a COPC for the vapor intrusion pathway.

4.7.1.4 Summary of Site 9 Vapor Intrusion Evaluation

Two soil gas analytes (1,1,2-TCA and benzene) and three groundwater analytes (naphthalene, TCE, and vinyl chloride) warranted a Tier 2 evaluation. Based upon a weight of evidence evaluation, 1,1,2-TCA, naphthalene, and TCE are not of potential concern for the vapor intrusion pathway and will not be considered further in the risk assessment. Vinyl chloride and benzene are COPCs for the vapor intrusion pathway based upon a weight of evidence evaluation and were quantified in the risk assessment. Infinite indoor air concentrations are modeled for the two COPCs according to the protocol detailed in Attachment H1.

4.7.2 Chemicals of Potential Concern for Site 13

The COPC selection process for surface soils, subsurface soils, groundwater via domestic use, groundwater via vapor intrusion, and soil gas are detailed in Tables H-2.6 through H-2.10. Because the rationale for determining soil and groundwater COPCs are thoroughly detailed on the previously referenced tables, additional details are not repeated here to prevent redundancy. Additional details pertaining to the Tier 1 and Advanced Tier I vapor intrusion evaluation are provided in the following text.

4.7.2.1 Indoor Air (Vapor Intrusion from Groundwater and Soil Gas) at Site 13

As of summer 2003, light nonaqueous-phase liquid (LNAPL) is present in groundwater around Building 397 at Site 13; active remediation is also occurring around B-397. In addition, in the southern portion of the OAC-009 plume, liquid-phase hydrocarbons also appear to be present. Data collected from wells with LNAPL are not appropriate for use in the HHRA, as they do not represent RME conditions. Rather, LNAPL is a source that is subject to remediation. NAPL is present in groundwater at Site 13, which precludes application of the most standardized and recognized model (the Johnson and Ettinger model [1991]) for an evaluation for vapor intrusion, in accordance with recent EPA guidance (EPA 2002c). To provide a complete evaluation of Site 13 data and to recognize that the vapor pathway is complete and (by virtue of the presence of NAPL as a continuing source) poses a human health risk at Site 13, the data were summarized into RAGS Part D standard Table 2s for discussion of the potentially complete passive pathways (vapor migration upward) and completeness. Nevertheless, the preferred method for evaluating vapor intrusion from LNAPL is the collection and analysis of soil gas samples (EPA 2002c), which is summarized in the following text.

It is important to note that at Site 13, TCE and its chlorinated breakdown products, where present, are not associated with the NAPL plumes on the rest of Site 13; thus, the petroleum NAPL (on a different part of the site) is not moving the TCE or acting as a carrier. At present, it is believed that the maximum chlorinated solvent concentrations on Site 13 at OU-2A originate on adjacent OU-2B Site 4; that HHRA is forthcoming and will address the center of that off-site plume. In this case, the spatial boundaries of the operable units at land surface are overlapped, precluding addressing plume-wide risks from groundwater vapors migrating to the land surface on a site-specific or OU-specific basis. EPA guidance for this pathway includes assessment of

each groundwater plume plus a 100-foot "buffer zone" to account for preferential migration such as this. Although the chlorinated plume originating off-site from Site 13 will be addressed under the OU-2B Site 4 HHRA, it continues onto Site 13; therefore, those concentrations measured on Site 13 were assessed in case future buildings are built on this location.

Soil gas data are available at Site 13. Since these data are available and less uncertainty exists for screening the soil gas pathway, soil gas data were screened against risk-based soil gas screening values (see Table H-2.8). The following analytes were retained as COPCs in soil gas for the vapor intrusion to indoor air pathway: 1,1,2,2-tetrachloroethane (PCA), 1,1,2-TCA, 1,2-DCA, benzene, ethylbenzene, and PCE, as evaluated further below.

4.7.2.2 Tier 1 Evaluation at Site 13

The following analytes were groundwater COPCs for the vapor intrusion to indoor air pathway: benzene, naphthalene, and TCE. None of these analytes exceeded its Tier 1 or Adjusted Tier 1 screening value (see Attachment H1, Table H1-2, and Table H-2.9); therefore, the vapor intrusion pathway for these analytes is not of potential concern. All levels are below risk-based screening values.

The following analytes were soil gas COPCs for the vapor intrusion to indoor air pathway: 1,1,2,2-PCA, 1,1,2-TCA, 1,2-DCA, benzene, ethylbenzene, and PCE (see Attachment H1, Table H1-2, and Table H-2.8). 1,1,2,2-PCA, 1,1,2-TCA, and 1,2-DCA were not detected in the shallow soil gas samples and had reporting limits below Tier 1 values (because of attenuation); therefore, the vapor intrusion pathway for these analytes is not of potential concern. Benzene, ethylbenzene, and PCE had maxima below Tier 1 values (because of attenuation); therefore, the vapor intrusion pathway for these analytes is not of potential concern. All levels are below risk-based screening values.

4.7.2.3 Summary of Site 13 Vapor Intrusion Evaluation

No groundwater or soil gas analytes are of potential concern for the vapor intrusion pathway; therefore, no analytes will be considered further in the HHRA. As stated in the previous text, however, samples containing NAPL were not subjected to this screen or HHRA. Wherever LNAPL is present on the water table, it is possible that the pathway is complete with more significant concentrations than those screened here. Thus, although no quantitative assessment of the vapor pathway because of NAPL is included (based on the recommendations in EPA 2002c), the pathway is complete and potentially significant for indoor air above LNAPL plumes.

4.7.3 Chemicals of Potential Concern for Site 19

The COPC selection process for surface soils, subsurface soils, groundwater via domestic use, groundwater via vapor intrusion, and soil gas are detailed in Tables H-2.11 through H-2.14. Because the rationale for determining soil and groundwater COPCs are thoroughly detailed on the previously referenced tables, additional details are not repeated here to prevent redundancy.

Additional details pertaining to the Tier 1 and advanced Tier I vapor intrusion evaluation are provided in the following text.

4.7.3.1 Indoor Air (Vapor Intrusion from Groundwater and Soil Gas) at Site 19

Two analytes (PCE and TCE) were initial groundwater COPCs for the vapor intrusion pathway. Of these analytes, only TCE exceeded its Tier 1 or adjusted Tier 1 screening value (see Table H1-3 of Attachment H1). TCE is evaluated in the advanced Tier 1 evaluation presented in the following text.

No soil gas samples were available for Site 19; this potential data gap is addressed in the advanced Tier 1 evaluation below.

4.7.3.2 Advanced Tier 1 Evaluation at Site 19

One groundwater analyte (TCE) warranted a further advanced Tier 1 evaluation (see Table H1-3 of Attachment H1). TCE has been detected 6 times in two wells (MWD13-4 and MWD13-3) since June 2001. Because these two wells are in proximity of one another (within approximately 70 feet), it is appropriate to evaluate the data as a whole. Groundwater concentrations indicate a slight decreasing trend since June 2001, although this may be because of seasonality and/or the temporal nature of groundwater. The maximum detected concentration (4.2 µg/L) in either of the two wells since June 2001 is much lower than the Tier 1 screening level (750 µg/L) but is slightly greater than the adjusted Tier 1 screening level (3.4 µg/L). The average concentration of groundwater in the well with the maximum detected concentration (MW13-4) over the past 2 years is approximately 3.14 µg/L, which is less than both the Tier 1 and adjusted Tier 1 screening values. Based upon this weight of evidence approach, TCE is not of significance for the vapor intrusion pathway and was not considered further in the HHRA.

The absence of soil gas data is not considered a data gap for this evaluation. Although soil gas data may have made it easier to evaluate the attenuation of soil gas within the vadose zone, groundwater concentrations of COPCs were so minor that it is unlikely that soil gas data would have altered any conclusions derived in this evaluation.

4.7.3.3 Summary of Site 19 Vapor Intrusion Evaluation

No groundwater analytes are of potential concern for the vapor intrusion pathway; therefore, no analytes were considered further in the HHRA because the pathway was determined to be insignificant at Site 19.

4.7.4 Chemicals of Potential Concern for Site 22

The COPC selection process for surface soils, subsurface soils, groundwater via domestic use, groundwater via vapor intrusion, and soil gas are detailed in Tables H-2.15 through H-2.19. Because the rationale for determining soil and groundwater COPCs are thoroughly detailed on the previously referenced tables, additional details are not repeated here to prevent redundancy. Additional details pertaining to the Tier 1 and Advanced Tier I vapor intrusion evaluation are provided in the following text.

4.7.4.1 Indoor Air (Vapor Intrusion from Groundwater and Soil Gas) at Site 22

LNAPL present in groundwater in and around Site 22 is undergoing active remediation. Data collected from wells with LNAPL are not appropriate for use in the HHRA because they do not represent RME conditions. Rather, LNAPL is a source that is subject to remediation. NAPL is present in groundwater at Site 22, which precludes application of the most standardized and recognized model (the Johnson and Ettinger model [1991]) for an evaluation for vapor intrusion, in accordance with recent EPA guidance (EPA 2002c). To provide a complete evaluation of Site 22 data and to recognize that the vapor pathway is complete and (by virtue of the presence of NAPL as a continuing source) poses a human health risk at Site 22, the data were summarized into RAGS Part D standard Table 2s for discussion of the potentially complete passive pathways (vapor migration upward) and completeness. Nevertheless, the preferred method for evaluating vapor intrusion from LNAPL is the collection and analysis of soil gas samples (EPA 2002c), which is summarized in the following text.

The following analytes were groundwater COPCs for the vapor intrusion to indoor air pathway: 1,2-DCA, benzene, chloroform, ethylbenzene; isopropylbenzene, naphthalene, toluene, PCE, TCE, and total-xylenes (see Table H-2.18 and Table H1-4 of Attachment H1). Although chlorinated solvents (chloroform, PCE, and TCE) were detected in recent samples, these analytes are not related to historical activities at Site 22 but are most likely artifacts of groundwater migration from off site (that is, not Site 22). Only benzene and TCE exceeded Tier 1 or adjusted Tier 1 values (see Table H1-4 of Attachment H1) and thus are evaluated in advanced Tier 1 evaluation presented in the following text.

The following analytes were soil gas COPCs for the vapor intrusion to indoor air pathway: benzene, chloromethane, ethylbenzene, m-xylene, o-xylene, and toluene (see Table H-2.18 and Table H1-4 of Attachment H1). Although some of the soil gas analytes (ethylbenzene and o-xylene) did not exceed Tier 1 or Adjusted Tier 1 values, they are considered in the advanced Tier 1 evaluation presented in the following text.

4.7.4.2 Advanced Tier 1 Evaluation at Site 22

Two groundwater analytes (benzene and TCE) and six soil gas analytes (benzene, chloromethane, ethylbenzene, m-xylene, o-xylene, and toluene) warranted a further advanced

Tier 1 evaluation (see Table H1-4 of Attachment H1). These analytes represent two different potential waste streams (chlorinated solvents and gasoline range organic hydrocarbons) and therefore will be evaluated separately.

The presence of TCE has been confirmed in 2 of 48 groundwater samples collected at Site 22. The maximum estimated concentration was detected at location M07C-08 in November 1997. Six additional groundwater samples have been collected at location M07C-08 since then, and all were nondetect for TCE. Also, the only other presence of TCE occurred at location MW-547-3 (estimated at 1.9 µg/L), which is approximately half the adjusted Tier 1 screening value of 3.4 µg/L. Finally, both shallow soil gas samples were nondetect for TCE; the maximum nondetected shallow soil gas concentration was 347 $\mu g/m^3$, with a Tier 1 screening level of 1,200 $\mu g/m^3$. Based upon this weight of evidence, TCE is not of potential concern for the vapor intrusion pathway and will not be considered further in the HHRA.

The maximum soil gas concentration (1,672 $\mu g/m^3$) for chloromethane was detected at 3.5 feet below ground surface, while soil gas data collected from 1.5 feet below ground surface had a concentration of 240 $\mu g/m^3$, which is below the Tier 1 screening value of 1,400 $\mu g/m^3$. Also, chloromethane has only been detected once since June 2001, with a concentration of 0.2 µg/L, which is below value needed for COPC selection (6.7 µg/L) and the Tier 1 screening value (5.6 µg/L). Based upon this weight of evidence approach, chloromethane is not of potential concern for the vapor intrusion pathway and is not considered further in the HHRA.

The remaining groundwater analyte (benzene) and five remaining soil gas analytes (benzene, ethylbenzene, m-xylene, o-xylene, and toluene) are all related to a similar source of gasoline range TPHs present at Site 22. Although some of the analytes do not exceed Tier 1 or adjusted Tier 1 screening values, they are considered in conjunction because they represent a similar source material. Concentrations of these analytes in soil gas are elevated, such that they warrant consideration in the risk assessment.

4.7.4.3 Summary of Site 22 Vapor Intrusion Evaluation

Two groundwater analytes (benzene and TCE) and six soil gas analytes (benzene, chloromethane, ethylbenzene, m-xylene, o-xylene, and toluene) warranted a detailed (advanced Tier 1) evaluation. Based upon a weight of evidence evaluation, TCE and chloromethane are not of potential concern for the vapor intrusion pathway and will not be considered further in the HHRA. Benzene in groundwater will be evaluated via soil gas values in the HHRA. The remaining soil gas analytes warranted consideration. Infinite indoor air concentrations are modeled according to the protocol detailed in Attachment H1.

4.7.5 Chemicals of Potential Concern for Site 23

The COPC selection process for surface soils, subsurface soils, groundwater via domestic use, groundwater via vapor intrusion, and soil gas are detailed in Tables H-2.20 through H-2.24. Because the rationale for determining soil and groundwater COPCs are thoroughly detailed on

the previously referenced tables, additional details are not repeated here to prevent redundancy. Additional details pertaining to the Tier 1 and advanced Tier I vapor intrusion evaluation are provided in the following text.

4.7.5.1 Indoor Air (Vapor Intrusion from Groundwater and Soil Gas) at Site 23

LNAPL is present in groundwater in/around Site 23 and is undergoing active remediation. Data collected from wells with LNAPL are not appropriate for use in the HHRA because they do not represent RME conditions. Rather, LNAPL is a source subject to remediation. NAPL is present in groundwater at Site 23, which precludes application of the most standardized and recognized model (the Johnson and Ettinger model [1991]) for an evaluation for vapor intrusion in accordance with recent EPA guidance (EPA 2002c). To provide a complete evaluation of Site 23 data and to recognize that the vapor pathway is complete and (by virtue of the presence of NAPL as a continuing source) poses a human health risk at Site 23, the data were summarized into RAGS Part D standard Table 2s for discussion of the potentially complete passive pathways (vapor migration upward) and completeness. Nevertheless, the preferred method for evaluating vapor intrusion from LNAPL is the collection and analysis of soil gas samples (EPA 2002c), which is summarized in the following text.

The following analytes were groundwater COPCs for the vapor intrusion to indoor air pathway: 1,2,4-trimethylbenzene, ethylbenzene isopropylbenzene, naphthalene, and sec-butylbenzene. Only 1,2,4-trimethylbenzene and isopropylbenzene exceeded its Tier 1 or adjusted Tier 1 screening value (see Table H1-5 of Attachment H1) and were evaluated in the advanced Tier 1 evaluation presented in the following text.

The following analytes were soil gas COPCs for the vapor intrusion to indoor air pathway: benzene, ethylbenzene, and PCE. Of these analytes, only benzene exceeded its Tier 1 screening value and was evaluated in the advanced Tier 1 evaluation presented in the following text (see Table H1-5 of Attachment H1).

4.7.5.2 Advanced Tier 1 Evaluation at Site 23

1,2,4-Trimethylbenzene and isopropylbenzene were detected in a single sample at concentrations greater than adjusted Tier 1 screening levels. Neither of these analytes is considered prevalent at Site 23 and this single sample likely represents a hot spot. Nevertheless, both analytes will be evaluated further in the HHRA.

Benzene was detected in the shallow soil gas sample at a concentration of approximately 104 $\mu g/m^3$; the deeper soil gas sample contained a concentration of approximately 79 $\mu g/m^3$. Only the shallow soil gas sample exceeded the Tier 1 value of 84 $\mu g/m^3$. The maximum detected concentration of benzene in groundwater since July 2002 is 0.2 $\mu g/L$, which is below the Tier 1 and Adjusted Tier 1 screening levels, and benzene was never detected in soil. Although there is

little evidence that a significant source of benzene exists at Site 23, benzene will be considered along with the substituted benzenes in HHRA.

4.7.5.3 Summary of Site 23 Vapor Intrusion Evaluation

1,2,4-Trimethylbenzene and isopropylbenzene in groundwater and benzene in soil gas warranted a detailed (Advanced Tier 1) evaluation. Infinite indoor air concentrations are modeled for the three COPCs according to the protocol detailed in Attachment H1.

5.0 EXPOSURE ASSESSMENT

An exposure assessment identifies potential human receptors that could be exposed to site-related chemicals as well as the routes, magnitude, frequency, and duration of the potential exposures. The conceptual site model (CSM) depicts potential transport mechanisms from each primary source (Figure H.5-1). The following components are included in the CSM: the identification of known or suspected sources of impact, potential chemical transport and exposure pathways, and receptors with associated routes of intake. Tracking of chemical migration from sources to human health receptors is an important use of the CSM and forms one basis from which risk-based decisions are evaluated.

An evaluation of all possible human exposures is necessary to identify receptors that are in current contact with or that could contact Alameda Point environmental media in the future. The principal objective of this evaluation is to identify RME at Alameda Point (EPA 1992b). As defined by EPA (1989), the RME is the maximum exposure that is reasonably expected to occur at a site. It should be emphasized, however, that the RME exposure applies to a single receptor; therefore, before risks are calculated, there must be a determination as to whether "it is likely that the same individual would consistently face the 'reasonable maximum exposure (RME)'" (EPA 1989, emphasis not added). Average or central tendency exposures (CTE) are also calculated and presented separately to provide points of comparison for the RME scenario.

It is also important that intake variable values for each RME exposure pathway should be "selected so that the combination of all intake variables results in an estimate of the reasonable maximum exposure for that pathway" (EPA 1989). In other words, the most conservative intake variables for each parameter for a given pathway are not necessarily used together. A combination of average and upper-bound values should be combined to estimate exposures that are meaningful and represent the actual reasonable maximum exposure for the site.

The exposure assessment for Sites 9, 13, 19, 22, and 23 included the following steps:

- Characterization of the exposure setting(s) and identification of potential future human receptors
- Identification of exposure pathways and exposure routes

- Estimation of EPCs
- Quantification of chemical intake for pathway specific exposures for each potential receptor

In accordance with EPA guidance (1989), all complete exposure pathways were selected for evaluation unless one of the following applies:

- A much higher level of exposure was expected to occur from another pathway involving the same medium at the same exposure point
- The potential magnitude of exposure was expected to be very low
- The probability of any exposures and the potential risks from those exposures were expected to be very low (as was the case for future hypothetical residential produce ingestion).

5.1 EXPOSURE SETTING AND POTENTIAL RECEPTORS

According to EPA (1989), the first step in identifying current or potential future chemical exposures is an evaluation of the physical characteristics of the site, such as climate, vegetation, soil type, and hydrology of surface water and groundwater that are pertinent to the risk assessment. Soil (including soil gas) and groundwater are the only media of concern at the Sites 9, 13, 19, 22, and 23, because surface water and sediment are not present within the boundaries of these land-locked sites.

5.1.1 Groundwater Use

Although groundwater has been evaluated individually for each site, historical data indicate that shallow groundwater in the East Bay Plain area is affected by high nitrate concentrations and saltwater intrusion (Alameda County Flood Control and Water Conservation District [ACFCWCD] 1988). According to the Alameda Point reuse plan (EDAW 1996), OU-2A is planned for mixed use including: R&D, light industrial, supporting retail, office, commercial and residential uses. After consideration of the factors that determine beneficial uses of groundwater and property reuse, the Alameda Point BCT concluded that the groundwater beneath Sites 9, 13, 19, 22, and 23 is unlikely to be used as a potential drinking water source. Consequently, the groundwater is not reasonably expected to serve as a public drinking water supply; however, beneficial use of groundwater for drinking water, irrigation, or industrial uses is not prohibited. The most conservative of these potential hypothetical uses (residential whole-house use, including residential ingestion) was retained in this HHRA.

5.1.2 Current Land Use

Although the installation has closed, some security, administrative, and maintenance personnel remain. Occasional recreational activities at the base may consist of jogging, walking, and picnicking, but these do not occur at CERCLA sites. Although not associated with Sites 9, 13, 19, 22, and 23, residential housing is located in the northeastern corner of the base. Some buildings on Alameda Point are leased for commercial or industrial use, but not on OU-2A. These general exposure scenarios cover the range of current exposure scenarios at Alameda Point. Because the future exposure scenarios associated with Alameda Point involve a greater extent and duration of exposure than current exposures, only future exposure parameters were used to evaluate risks associated with these scenarios (that is, only future scenarios were evaluated).

5.1.3 Future Land Use

OU-2A is planned for mixed use including: R&D, light industrial, supporting retail, office, commercial and residential uses (EDAW 1996). Community-oriented institutions are such as places or worship and nonprofit organizations are also considered allowable and desirable uses.

Commercial/industrial exposures are the most reasonable exposure scenarios for future land use at Sites 9, 13, 19, 22, and 23. Construction worker exposures are also possible and were evaluated. Residential land use has been evaluated for these sites, although the five sites are likely to be developed for mixed land uses. The identification of potential receptors and land reuse has been guided solely by reuse plans for the base (EDAW 1996).

Since there are no planned parks in the inner harbor area (with the exception of the southern shoreline area, which does not include OU-2A), there are no planned recreational uses for OU-2A. Accordingly, as agreed among the agencies at an OU-2A scoping meeting (Tetra Tech 2001a), recreational receptors were not specifically evaluated in this HHRA. This determination was based, in part, on the fact that no primarily recreational areas are located on OU-2A as well as the fact that the residential assessment is more conservative, given its increased exposure frequencies and durations relative to a recreational scenario.

For Sites 9, 13, 19, 22, and 23, the residential, commercial/industrial, and construction worker exposure scenarios are considered potentially complete based on reuse plans developed for Alameda Point. Exposures to chemicals in soil, soil gas, and groundwater were evaluated for each potential receptor on a site-specific basis.

5.2 Exposure Pathways and Exposure Routes

All relevant exposure pathways were evaluated for future commercial/industrial, recreational, and residential exposure scenarios. According to EPA guidance (1989), an exposure pathway consists of four elements:

- A source and mechanism of chemical release
- A retention or transport medium (or media in cases involving transfer of chemicals)
- A point of potential human contact with the contaminated medium (referred to as the exposure point)
- An exposure route (such as ingestion) at the contact point

Eliminating any of these elements (except in a case where the source itself is the point of exposure) results in an incomplete exposure pathway; therefore, if no receptors could contact the source or transport medium, the exposure pathway is incomplete and is not evaluated. Similarly, if human contact with a medium is not possible, the exposure pathway is considered incomplete and is not evaluated. Because many of these pathways are based on future exposures, they are considered potentially complete and evaluated to provide a conservative estimate of risk. Not all of these pathways may actually be complete for all receptors in the future.

Table H-1.1, Selection of Exposure Pathways (RAGS Part D standard Table 1) indicates which exposure pathways are complete for each exposure scenario, and the rationale for exclusion or inclusion of each pathway/receptor combination. Routes of potential exposure associated with commercial/industrial, construction, and residential exposures at Sites 9, 13, 19, 22, and 23 are described in the following sections.

5.2.1 Current/Future Commercial/Industrial Worker Exposure

The current/future commercial/industrial worker exposure scenario was evaluated for the following pathways in surface soil (0 to 2 feet bgs):

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of chemicals adsorbed to windblown soils and volatiles released from soils

Also, the current/future commercial/industrial worker exposure scenario was evaluated for the following pathway associated with groundwater:

- Inhalation of indoor air vapors from groundwater vapor intrusion

5.2.2 Future Hypothetical Resident Exposure

The future hypothetical resident exposure scenario was evaluated for the following pathways in surface soil (from 0 to 2 feet bgs):

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of chemicals adsorbed to windblown soils and volatiles released from soils
- Ingestion of homegrown produce

The future hypothetical resident exposure scenario was evaluated for the following pathways in subsurface soil (0 to 10 feet bgs) in the event that subsurface soils become surface soils as a result of construction activities:

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of chemicals adsorbed to windblown soils and volatiles released from soils
- Ingestion of homegrown produce

The future hypothetical resident exposure scenario was evaluated for the following pathway associated with groundwater:

- Inhalation of indoor air vapors from groundwater vapor intrusion

The future hypothetical resident exposure scenario was evaluated for the following pathways associated with groundwater:

- Ingestion as a drinking water source
- Dermal contact during domestic use
- Inhalation of vapors during domestic use

5.2.3 Current Construction Worker Exposure

The current construction worker exposure scenario was evaluated for the following pathways in surface soil (from 0 to 2 feet bgs):

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of chemicals adsorbed to windblown soils and volatiles released from soils

Construction workers will have little to no dermal contact with groundwater because of the average depth to groundwater, which is found at a depth greater than 8 feet bgs. Thus, construction worker exposures to groundwater were not assessed in this HHRA.

5.2.4 Future Construction Worker Exposure

The future construction worker exposure scenario was evaluated for the following pathways in subsurface soil (from 0 to 10 feet bgs) in the event that subsurface soils become surface soils because of construction activities:

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of chemicals adsorbed to windblown soils and volatiles released from soils

Construction workers will have little to no dermal contact with groundwater because of the average depth to groundwater, which is greater than 8 feet bgs. Thus, construction worker exposures to groundwater were not assessed in this HHRA.

5.3 EXPOSURE POINT CONCENTRATIONS

EPCs for chemicals in each medium were estimated for each site using values from the site dataset. Based on evaluation of DQOs for data usability, it was determined that a combination of data from a number of different sampling efforts was appropriate. Within each medium, descriptive statistics were calculated for all chemicals detected. In accordance with EPA guidance (EPA 2002d), the 95th percentile upper confidence limit on the arithmetic mean (UCL_{95}) was calculated and used as the EPC in the HHRA to estimate chemical intakes. The UCL_{95} is defined as a value that, when calculated repeatedly for randomly drawn subsets of site data, equals or exceeds the true mean 95 percent of the time (EPA 1992b). The UCL_{95} is a better predictor of actual chronic exposure conditions than the maximum concentration because it is based on the probability of long-term random contact with contaminated areas. In areas where the UCL_{95} exceeded the maximum chemical concentration, however, the maximum concentration was used as the EPC. The following sections set forth the decisions (beyond the data reduction step) made for developing EPCs according to EPA (2002d) and Navy (2001) guidance.

5.3.1 Distribution Testing

The Shapiro-Wilk W test was conducted for all samples with at least five measurements and detection frequencies greater than or equal to 50 percent. The W test is one of the most powerful tests for determining whether a set of measurements follows either a normal or lognormal distribution. The W test relies on computing a correlation between the quantiles of the standard normal distribution and the ordered values of the observed data. When the W statistic is close to

1.0, the observed data will follow an essentially straight line when displayed using a normal probability plot. The following null (H_0) and alternative (H_A) hypotheses were tested using the W test, as follows:

H_0: the data follow a normal distribution

H_A: the data do not follow a normal distribution

Tests were conducted sequentially on data in original and natural-log transformed units. A Type I error rate (alpha) of 0.05 (equivalent to 5 percent) is used to interpret the significance of each test. A Type I error rate of 0.05 means that there is a 5 percent chance that the null hypothesis will be rejected when it is true (that is, the data are normally distributed), leading to the false conclusion that the underlying distribution is not normal. When the test is conducted using log-transformed data, failure to reject H_0 leads to the conclusion that the data follow a lognormal distribution (rejection of H_0 indicates that the data are not lognormally distributed).

Censored (nondetect) data were evaluated using the reporting (or detection) limit for each chemical. Chemicals confirmed as following a normal or lognormal distribution based on the outcome of the W test were listed as "normal" or "lognormal," respectively, in Tables H-3.1 through H-3.30. Chemicals not confirmed as either normal or lognormal were further evaluated by examining normal and lognormal probability plots, outlier box-plots, and frequency histograms. Professional judgment was used to select the distribution that most closely fits the data. Chemicals judged to best fit a normal or lognormal model were listed as "Other [N]" or "Other [T]", respectively, in summary tables. No assessment is conducted for sample sizes less than 5 samples or detection frequencies less than 50 percent, and these chemicals were listed as "not tested" in the tables. All EPC statistics are presented in RAGS Part D standard Table 3 format in Tables H-3.1 through H-3.30.

For cases where the sample size is small (approximately 5 to 20 samples, with detection frequencies greater than or equal to 50 percent) and results of the W test or assessments based on professional judgment indicate that the data do not fit either a normal or lognormal distribution, several options were available: to assign a "default" distribution in subsequent calculations or to select the distribution that provides the closest relative fit. Selection of lognormal as the default distribution will result in the most conservative (highest) concentrations when estimating EPCs (see additional discussion below on estimating EPCs using lognormal models for highly skewed data sets). A second option for calculating EPCs was to use a nonparametric bootstrapping technique that is not based on assuming a particular underlying distribution (following EPA 2002d), as discussed in Section 5.3.3.

5.3.2 Summary Statistics (Population Moments) and Proxy Values

Calculation of the mean, standard deviation, and UCL_{95} was conducted for samples with at least one detected measurement with a minimum of three samples. Calculations were performed using distribution-dependent formulae. The mean and standard deviation were determined by

taking the median values for the mean and standard deviation generated during calculation of the distribution of the UCL_{95} described previously. The median (50^{th} percentile) and 95^{th} percentile were calculated for all samples, irrespective of the detection frequency, using nonparametric assumptions (that is, based strictly on a rank ordering of the combined detected and estimated measurements). The reporting (or detection) limit was substituted as a proxy value for censored data in calculations of the median and 95^{th} percentile concentrations.

For samples with at least 85 percent detected data, one-half the reporting (or detection) limit is substituted as a proxy value for censored (nondetect) data. For samples confirmed or assumed to follow a lognormal distribution, minimum variance, unbiased estimates of the mean and standard deviation were calculated using equations 13.3 and 13.5, respectively, published by Gilbert (1987). The UCL_{95} for lognormal distributions was calculated using the Land's method, patterned after Gilbert (1987) and EPA (1992b, 2002d) publications.

For samples with greater than 15 percent censored (reported nondetect) data, population moments were calculated using stochastic modeling, following the "bounding" approach described by EPA (2002d). This approach treats each censored datum as a random variable that can assume any value between zero and its respective reporting (or detection) limit. A Monte Carlo method is used to calculate a minimum of 2,000 values for the UCL_{95}, each time substituting random values for each censored measurement. A distribution of all values for the UCL_{95} is then constructed, and the minimum, median, 95^{th} percentile, and maximum values were recorded. A small range (difference between the minimum and maximum) for the distribution indicates that censored measurements contribute little to the uncertainty of the estimate. In practice, this generally is not the case, and it is necessary to select a concentration that can be used as a "plausible upper bound" for the UCL_{95}. For Alameda OU-2A, the 95^{th} percentile of the distribution is suggested for use as the upper bound concentration. The maximum concentration is not used because it represents the highest concentration that could theoretically be calculated (or nearly so based on 2,000 calculations) from the sample data and, therefore, represents a worst case concentration rather than a plausible upper bound.

5.3.3 Nonparametric Statistics (Bootstrapping Techniques)

Singh, Singh, and Engelhardt (1997) discuss situations where application of Land's method for calculating the UCL_{95} of lognormal distributions can result in estimates that are inappropriately high for practical use in risk assessments. This is most likely to occur in populations that are highly skewed (coefficients of variation greater than 1.0). High positive skewness also can be a result of biased sampling, the presence of outliers, or when data represent a mixture distribution of more than one subpopulation (i.e., the data are not characteristic of a "true" lognormal distribution). Singh, Singh, and Engelhardt (1997) also add that small sample-sizes (less than 30) can be an additional obstacle that further complicates identifying the underlying distribution of the data.

Singh, Singh, and Engelhardt (1997) suggest a number of alternative approaches that might be used in these cases, including the use of bootstrapping, jackknife estimators, and both the central limit and Chebychev's theorems. The protocols recommended for use at Alameda Point reflect

that there are situations when the underlying distribution cannot be determined with confidence (or use of the lognormal assumption is suspect) and, therefore, support the use of the nonparametric bootstrap as an alternative means of calculating upper confidence limits of the mean. It is recommended, however, that bootstrapping methods that incorporate some form of bias correction be used in place of the standard bootstrap. An excellent introduction to the bias-corrected and accelerated bootstrap, Hall's bootstrap *t*, and other approaches are provided by Efron and Tibshirani (1993). It also should be noted that Singh, Singh, and Engelhardt (1997) do not address (nor support) application of bootstrapping when censored data are present. Bootstrapping alone does not address the uncertainty inherent in using fixed proxy values in place of data below the detection limit. For this reason, it is recommended that any application of the bootstrap approach with censored data treat each nondetect value as a random variable, which can assume any value between zero and the reporting (or detection) limit. Thus, the recommendations of EPA (2002d) using the "bounding" approach were applied in the calculation of nonparametric EPCs for OU-2A.

5.4 QUANTIFICATION OF CHEMICAL INTAKE FOR PATHWAY SPECIFIC EXPOSURES FOR EACH POTENTIAL RECEPTOR

In this section of the HHRA, chemical intake rates were estimated for all complete exposure pathways based on the EPCs and on the estimated magnitude of exposure to contaminated media. Exposure is based on "intake," which is defined as the mass of a substance taken into the body per unit body weight per unit time. Intake from a contaminated medium is determined by the amount of the chemical in the medium, the frequency and duration of exposure, body weight, the contact rate, and the averaging time. The following is a generic algorithm that is used to calculate chemical intake:

$$I = \frac{EPC \times CR \times EF \times ED}{BW \times AT}$$

where

I = intake (milligram per kilogram body weight-day [mg/kg-day])

EPC = exposure point concentration in contaminated medium (milligram per kilogram [mg/kg] or mg/L)

CR = contact or ingestion rate (milligrams soil per day or liters per day)

EF = exposure frequency; how often exposure occurs (days per year)

ED = exposure duration; how long exposure occurs (years)

BW = body weight (kilogram [kg])

AT = averaging time; period over which exposure is averaged (days)

Specific equations used to estimate chemical exposures for each complete pathway are presented in Tables H-4.1 through H-4.4.

5.4.1 Standard Exposure Assumptions Used

As previously noted, EPA (1989) requires that exposure parameters used to determine chemical intakes for a given pathway should be selected so that the estimated intake represents the average and RME exposure. Site-specific and EPA default values for exposure parameters were used in the HHRA for Sites 9, 13, 19, 22, and 23. Tables H-4.1 through H-4.4 (the RAGS Part D standard Table 4 series) present the equations and exposure parameters used to estimate chemical intake for residential, commercial/industrial, and construction worker receptors. Default hypothetical future residential and commercial/industrial exposure parameters recommended by EPA Region IX and DTSC were employed, as referenced in detail for each parameter and scenario in the standard RAGS Part D Table 4 format.

RME intakes for future receptors (including hypothetical future residential, commercial/industrial, and construction worker) were calculated. The results of these calculations are presented in the site-specific HHRAs in Section 7. CTE exposures were also calculated for comparison purposes and are presented in Attachment H2.

5.4.2 Pathway-Specific Intake Considerations

Chemical intake via ingestion and inhalation is quantified as an administered dose; however, chemical intake from dermal exposure is estimated as an absorbed dose. Dermal contact equations have additional exposure parameters of adherence and absorption factors or permeability constants. Adherence factors indicate the amount of soil that adheres to the skin. Absorption factors reflect desorption of the chemical from soil and absorption of the chemical across the skin. Permeability constants represent the rate at which a chemical in water penetrates the skin.

EPCs of particulates released from soil to outdoor air were estimated using the soil EPCs as the source term and methodology provided by EPA Region IX in its memorandum describing the derivation of PRGs (EPA 2002b). To derive the EPCs in outdoor air, the soil EPC was multiplied by the reciprocal of the particulate emission factor (PEF), which is a nonchemical-specific value that relates chemical concentrations in soil to airborne concentrations that may be inhaled. A conservative PEF was used, assuming future unvegetated (highly erodable) soils, although this assumption is not reflective of current (mainly paved or otherwise covered) conditions. While the EPC for inhalation of outdoor air particulates is in units of milligrams per cubic meter (mg/m^3), this inhalation EPC is calculated within the intake equation shown in each of the RAGS Part D standard Table 4s.

For residential and commercial/industrial exposures, volatilization of analytes (vapors) into a hypothetical residential or standard commercial/industrial building were also included in the risk evaluations for areas with volatile COPCs in shallow zone groundwater. The EPCs for this pathway were obtained from the groundwater vapor intrusion model (EPA 2003a), which is based upon the Johnson and Ettinger model (1991). The model uses site-specific input parameters and default hypothetical residential and commercial/industrial building parameters to estimate an indoor air concentration. The indoor air concentration is then used in the risk assessment to estimate risks from the vapor intrusion pathway. Site-specific input parameters, residential and commercial/industrial building parameters, and a description of the Johnson and Ettinger equation is provided in Attachment H1.

Ingestion of homegrown produce was evaluated for the residential exposure scenario. Direct measurements of chemical concentrations in homegrown produce are not available for OU2A because homegrown produce is not currently grown at Alameda Point. Exposure point concentrations in homegrown produce for the residential exposure scenario were estimated based on chemical concentrations of COPCs in soil using soil-to-plant uptake factors (UF) that estimate the root uptake of chemicals from soil and translocation of chemicals to the edible plant parts. UFs for nonvolatile organic chemicals were developed using DTSC methodology (DTSC 1993b), and UFs for inorganic chemicals were obtained from EPA (EPA 1996a). The EPA guidance provides UFs for 6 inorganic chemicals: arsenic, cadmium, mercury, nickel, selenium, and zinc.

For nonvolatile organic chemicals, it was found that the uptake of organic contaminants could be related to the octanol-water partition coefficient (K_{ow}) and the organic carbon partition coefficient (K_{oc}) of the contaminant and the fraction of organic carbon in the soil (F_{oc}) (Briggs and Others 1982). The equation used to calculate the uptake factor is as follows:

$$UF = \frac{(0.03 \times K_{ow}\text{^}0.77) + 0.82}{(K_{oc})(F_{oc})}$$

where

UF = Soil-to-plant uptake factor

K_{ow} = Octanol-water partition coefficient (cubic centimeters per gram [cm^3/g])

K_{oc} = Organic carbon-water partition coefficient (cm^3/g)

F_{oc} = Fraction organic carbon content in soil

K_{ow} and K_{oc} values were obtained from EPA's "Soil Screening Guidance: Technical Background Document" (EPA 1996) and from the documentation for DTSC's CalTOX model, when not

available from EPA. F_{oc} was assumed to be 0.002, based upon site-specific soil conditions at OU2A.

Consistent with EPA guidance, an empirical correction factor of 0.01 was applied to lipophilic COPCs to reduce the estimated produce concentration (EPA 1994d, 1998). Lipophilic chemicals are defined as chemicals for which the log K_{ow} is greater than 4. EPA assumes lipophilic chemicals do not readily pass into the edible portions of produce.

Risks associated with VOCs were not evaluated for the homegrown produce exposure pathway. VOCs are typically low-molecular-weight compounds that do not persist or bioaccumulate in the environmental (EPA 1994c). Because VOCs are typically lost from surface soil through volatilization, soil concentrations measured during the site investigation studies are not representative of concentrations over a 30-year period, which is the exposure duration assumed for the residential exposure scenario. For the purposes of this evaluation, COPCs listed in the EPA PRG table as volatile were considered VOCs (EPA 2002b).

EPA estimates that homegrown fruits and vegetables account for 4 percent and 6.8 percent, respectively, of receptor diets (EPA 1997b). Using the 95th percentile of fruit and vegetable intakes (12 grams per kilogram per day [g/kg-day] and 10 g/kg-day, respectively) to estimate the RME homegrown produce consumption rates, a 70 kilogram adult would ingest 33.6 g/day of homegrown fruits and 47.6 g/day of homegrown vegetables. A 15 kilogram child would ingest 7.2 and 10.2 grams per day of homegrown fruits and vegetables, respectively. Accordingly, the corresponding RME homegrown produce consumption rates (the total of fruit and vegetable consumption rates) are 81.2 grams per day for the adult resident, and 17.4 grams per day for the child resident. To evaluate the CTE scenario, EPA recommends intake rates of 3.4 g/kg-day for fruits and 4.3 g/kg-day for vegetables. Applying the same fraction of 4 percent and 6.8 percent of homegrown fruits and vegetables, respectively, in a typical receptor diet as assumed in the RME scenario, an adult resident in a CTE scenario would ingest 9.5 grams per day of fruits and 20.5 grams per day of vegetables, for a total of 30 grams per day. A child resident in a CTE scenario would ingest 2 grams per day of fruits and 4.4 grams per day of vegetables, for a total of 6.4 grams per day.

EPA suggests that for home gardeners, a high-end dietary fraction of 0.4 is assumed for the ingestion of contaminated fruits and vegetables grown onsite (EPA 1996a). Accordingly, an FI of 0.4 is used for the RME scenario. For the CTE scenario, it is assumed that homegrown produce represents 20 percent of a resident's diet; therefore, an FI of 0.2 is used.

6.0 TOXICITY ASSESSMENT

Standard toxicological methodologies for assessing the toxicity of chemicals involve quantifying the dose-response relationships for adverse human health effects associated with exposure to specific chemicals. There are two categories of toxic chemicals: carcinogenic and noncarcinogenic. While not all chemicals have carcinogenic potential, all are assumed to have some noncarcinogenic effect at a high dose. Carcinogenic chemicals' potency was evaluated and

presented separately from noncarcinogenic chemical potency in this Alameda Point OU-2A HHRA.

The toxicity assessment identifies the RfDs and SFs used to evaluate adverse noncancer health effects and cancer risks. The major toxicological effects associated with the COPCs are also presented. The following are the sources of toxicity values used for the EPA-based HHRA, in order of preference:

- EPA's IRIS. The on-line database that contains EPA-approved RfDs and SFs (EPA 2003a). The RfDs and SFs have undergone extensive review and are recognized as high-quality, agency-wide consensus information.
- The EPA National Center for Environmental Assessment (NCEA) provisional values, which continue to be used as of November 2002 in Region IX (as cited by EPA [2002b]).
- EPA's Health Effects Assessment Summary Tables (HEAST) (EPA 1997a)

Consistent with Navy (2002) guidance on dual tracking, DTSC toxicity values were considered only if a value 4 times more conservative (that is, either at least four 4 times less [for noncancer effects] or 4 times greater [for cancer effects]) than the corresponding EPA toxicity value (Navy 2002) is available. Possible sources of toxicity values used to conduct the DTSC-based HHRA are as follows:

- Cal/EPA on-line database, "California Cancer Potency Factors: Update" (Cal/EPA 2002). This memorandum provides a compilation of SFs developed or approved by offices and departments within Cal/EPA.
- Reference exposure levels (REL) available from Cal/EPA (1997). The Air Toxicology and Epidemiology Section within Cal/EPA develops and publishes RELs. RELs are health-based exposure levels for characterization of risk from air emissions.

More specifics on the "dual tracking" approach are presented in Section 6.6.

6.1 REFERENCE DOSES

The potential for adverse noncancer health effects to result from exposure to chemicals was characterized by comparing an exposure estimate (intake) with an RfD. EPA (1989) defines an RfD as an estimate (with uncertainty that spans perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects. The RfDs are expressed as mg/kg-day and are specific to the chemical, exposure route (for example, ingestion or inhalation), and exposure duration (chronic or subchronic). The sources of RfDs used in the HHRA for OU-2A (in order of preference) were IRIS, NCEA, and HEAST (EPA 2003a, 1997a), as described and

cited in Section 6. This approach is as adopted by EPA Region IX as their hierarchy for developing PRGs (EPA 2002b).

EPA derives RfDs to assess oral exposures and reference concentrations (RfC) to assess exposure via inhalation and publishes these values and supporting information in IRIS (EPA 2002b) and HEAST (EPA 1997a). The RfCs are concentrations in air expressed as mg/m^3 and were converted to RfDs using the following equation:

$$RfD = \frac{RfC \times IR}{BW} \qquad (6\text{-}1)$$

where

RfD	=	Reference dose (mg/kg-day)
RfC	=	Reference concentration (mg/m^3)
IR	=	Inhalation rate assumption (20 m^3/day)
BW	=	Body weight assumption (70 kg)

Consistent with DTSC guidance (1992), oral RfDs were used to assess dermal exposure in the absence of route-specific dermal RfDs. Chronic RfDs are developed for evaluating exposures that occur over periods of more than 7 years, and subchronic RfDs are for exposures of less than 7 years. Although the potential exposures considered in this risk assessment are for periods of from 1 to 30 years, chronic RfDs were used to evaluate both chronic and subchronic exposures. Few subchronic RfDs were available, and the use of only one set of RfDs simplified the analysis. Using chronic RfDs results in more conservative estimates of potential hazard, but because the site and incremental HIs at Sites 09 and 10 were well below levels of concern for all receptors evaluated, the use of chronic RfDs did not affect the interpretation or conclusions of the assessment.

RfDs and RfCs are derived by EPA work groups. The EPA work groups review all relevant human and animal studies for each chemical and select the study (or studies) pertinent to the derivation of the specific RfD. RfDs are often derived from a measured or estimated no observed adverse effect level (NOAEL). The NOAEL corresponds to the dose, in mg/kg-day, that can be administered without inducing observable adverse effects. If a NOAEL cannot be determined, the lowest observed adverse effect level (LOAEL) is used. The LOAEL corresponds to the lowest daily dose administered that induces an observable adverse effect. The toxic effect characterized by the LOAEL is referred to as the "critical effect."

NOAELs are most often based on data from experimental studies in animals. Both the experimental parameters and the extrapolation of animal data to humans are potential sources of uncertainty; therefore, in deriving an RfD, the NOAEL or LOAEL is divided by uncertainty factors to ensure that the RfD will be protective of human health. The uncertainty factors usually

occur in multiples of 10, and each factor represents a specific area of uncertainty inherent in the extrapolation from available data. Uncertainty factors account for the following:

- Extrapolation of data from animals to humans (interspecies extrapolation)
- Variation in human sensitivity to the toxic effects of a compound (intraspecies differences)
- Derivation of a chronic RfD based on a subchronic rather than a chronic study
- Derivation of an RfD based on a LOAEL rather than a NOAEL

Modifying factors between 0 and 10 may also be applied to accommodate other factors or additional uncertainty associated with the data. For most compounds, the modifying factor is 1. The chronic RfDs used for the Alameda Point OU-2A HHRA are presented in Tables H-5.1 and H-5.2.

6.2 SLOPE FACTORS

The toxicity information considered in the assessment of potential cancer risks includes a weight of evidence classification and a SF. The weight of evidence classification qualitatively describes the likelihood that a chemical is a human carcinogen and is based on an evaluation of the available data from human and animal studies. Chemicals evaluated by EPA since the publication of the 1996 cancer guidelines, "Proposed Guidelines for Carcinogen Risk Assessment" (EPA 1996b), are evaluated using a weight of evidence narrative and one of the following descriptors for classifying potential carcinogenicity to humans: known/likely, cannot be determined, and not likely. Chemicals evaluated by EPA before the publication of the 1996 guidelines were evaluated in accordance with the 1986 guidelines (EPA 1986). These chemicals were classified using an alphanumeric system in which the chemical was assigned to one of five groups: Group A, a known human carcinogen; Groups B1 and B2, a probable human carcinogen; and Group C, a possible human carcinogen. Chemicals that could not be classified as human carcinogens because of lack of data were categorized in Group D, and chemicals for which there was evidence of noncarcinogenicity in humans were categorized in Group E.

An SF is an upper bound estimate, approximating a 95 percent upper confidence limit on the increased cancer risk from lifetime exposure to a chemical (EPA 1989). The SFs used to assess cancer risk were obtained from IRIS (EPA 2003a).

Similar to RfDs, SFs are specific to the chemical and route of exposure and are available for oral and inhalation exposures. EPA typically publishes inhalation unit risks instead of inhalation SFs. The unit risks were converted to inhalation SFs using the following equation:

$$SF = \frac{UR \times BW \times UCF}{IR} \quad (6\text{-}2)$$

where

SF	=	Slope factor $(mg/kg\text{-}day)^{-1}$
UR	=	Unit risk ($\mu g/m^3$)
BW	=	Body weight assumption (70 kg)
UCF	=	Unit conversion factor (1,000 micrograms per milligram)
IR	=	Inhalation rate assumption (20 m^3/day)

As with RfDs, oral SFs were used to estimate cancer risks for exposures via the dermal route if no dermal SF was available; however, surrogate chemicals were not used to characterize cancer potency. The SFs used in this assessment are presented in Table H-6.1 and H-6.2.

6.3 ROUTE-TO-ROUTE EXTRAPOLATION

Toxicity values are available for only one route of exposure (that is, for only the inhalation or the oral exposure route) for some chemicals. In some of these cases, route-to-route extrapolations were conducted so that toxicity values developed for one route of exposure (for example, the oral route) were applied to another (for example, the inhalation route). This approach assumes that toxicity is identical regardless of the route of exposure. Route-to-route extrapolations are recommended for organic analytes by the State of California (DTSC 1992) and are used by EPA Region IX to develop PRGs (EPA 2002b). Although EPA guidance (EPA 1996b) generally does not recommend them (as the procedure does not account for route of administration, target organ, portal of entry effects, and other physical or chemical effects as required by EPA guidance), use of route-to-route extrapolation is consistent with the EPA Region IX approach to developing PRGs. Route-to-route extrapolation in this manner increases the uncertainty of the risk assessment results (see Section 8.3).

As previously mentioned, oral RfDs and SFs were used to quantify effects associated with dermal exposures for all COPCs because dermal toxicity values have not been developed. Route-to-route extrapolations were also used for organic COPCs in the following cases:

- If an organic oral toxicity value (RfD or SF) but no inhalation toxicity value was available, the oral toxicity value was also used as the inhalation toxicity value.
- If an organic inhalation toxicity value but no oral toxicity value was available, the inhalation toxicity value was also used as the oral toxicity value.

Such route-to-route extrapolations were not used for metals because their toxicological endpoints are heavily dependent on the exposure route (EPA 2002b). Route-to-route extrapolations for

organic compounds and other exceptions to the RfDs and SFs used in the HHRA are denoted with an "R" (for route extrapolated) in Tables H-5.1 through H-6.2.

In the case of dermal exposure, toxicity values were derived from oral toxicity values. In doing so, no adjustment was made to the oral RfDs and SFs to take into account differences in gastrointestinal and dermal absorption per EPA Region IX guidance (EPA 2002b). DTSC also prefers the use of unadjusted toxicity values for estimating risks and hazard indices from dermal exposure. For the HHRA, oral toxicity values are used to evaluate dermal exposures since, for many chemicals, a scientifically defensible database does not exist for making an adjustment to the oral slope factor/RfD to estimate a dermal toxicity value. Based on the current guidance (EPA 2001b), the only chemical for which an adjustment is recommended is cadmium, which was not a COPC for any medium at any site; thus, for the OU-2A HHRAs, only unadjusted toxicity values (assuming 100 percent gastrointestinal absorption) were used for the dermal toxicity assessment (see Tables H-5.1 and H-6.1).

6.4 SURROGATES

Because of a lack of EPA Region IX PRGs for screening chemicals to identify COPCs, the following surrogates were employed to avoid leaving data gaps in the HHRA (EPA 2002b):

- Pyrene was used as a surrogate to represent phenanthrene and benzo(ghi)perylene, which have no EPA Region IX PRG or chemical-specific toxicity factors.
- While not completely a surrogate as such, total chromium toxicity values and PRGs appropriately and conservatively represented the total chromium detected at OU-2A
- Diisopropyl ether does not have an EPA Region IX PRG or chemical-specific toxicity factor and was not evaluated; however, it is not suspected to be associated with any former processes at the site.
- Naphthalene was used as a surrogate for 2-methylnaphthalene, which does not have an EPA Region IX PRG or chemical-specific toxicity factors.
- Cis-1,2-DCE was used as a surrogate for total 1,2-DCE, which does not have an EPA Region IX PRG or chemical-specific toxicity factors.
- 3-methylphenol was used as the surrogate for 4-chloro-3-methylphenol, which does not have an EPA Region IX PRG or chemical-specific toxicity factors.
- Total xylenes was used as the surrogate for all xylene isomers (including m-, mixed m-/p, and o-xylenes) that do not have EPA Region IX PRGs or chemical-specific toxicity factors.
- 1,2-DCA was used as the surrogate for 1,3-dichloropropane, which does not have an EPA Region IX PRG or chemical-specific toxicity factors.

- 2-methylphenol was used as the surrogate for 4,6-dinitro-2-methylphenol, which does not have an EPA Region IX PRG or chemical-specific toxicity factors.
- Phenol was used as the surrogate for 4-nitrophenol, which does not have an EPA Region IX PRG or chemical-specific toxicity factors.
- Isobutanol was used as the surrogate for tert-butanol, which does not have an EPA Region IX PRG or chemical-specific toxicity factors.
- Toluene was used as the surrogate for p-isopropyltoluene, which do not have EPA Region IX PRGs or chemical-specific toxicity factors.
- Free cyanide was used as the surrogate for cyanide, which does not have an EPA Region IX PRG or chemical-specific toxicity factors.
- Chlordane was used as the surrogate for alpha- and gamma-chlordane, which do not have isomer-specific EPA Region IX PRGs or chemical-specific toxicity factors.
- 1,2,4-trichlorobenzene was used as the surrogate for 1,2,3-trichlorobenzene, which does not have an EPA Region IX PRG or chemical-specific toxicity factors.
- 2-hexane was used as the surrogate for 2-hexanone, which does not have an EPA Region IX PRG or chemical-specific toxicity factors.

6.5 LEAD

No consensus-based toxicity values are available for lead, which is a contaminant of particular toxicological concern wherever child receptors and other sensitive subpopulations may come into contact with lead-contaminated media. The potential for human health effects caused by lead is typically estimated on the basis of blood-lead concentrations. Mathematical models have been developed to estimate blood-lead levels on the basis of total lead uptake from exposures by diet, drinking water, air, and soil. Based on these models, the maximum detected concentrations for lead in soils were compared against the EPA Region IX residential PRG of 400 mg/kg (EPA 2002b) as well as the Cal-modified PRG of 150 mg/kg. These comparisons are shown (for soil) in the RAGS Part D standard COPC selection tables (Tables H-2.1 and following). The risk characterization findings related to lead are presented in Section 7, which also discusses the Cal-modified residential PRG of 150 mg/kg, where lead was a COPC.

6.6 DUAL TRACKING

The DTSC maintains its own toxicity criteria database. To provide for a conservative estimate of potential toxic responses measured by using DTSC toxicity values, DTSC advocates use of state of California toxicity values. These California toxicity values are used in developing the "Cal-modified" PRG used by Region IX. In its background document regarding the development of the Cal-modified PRGs, EPA (2002b) noted the following:

> When EPA Region IX first came out with a Draft of the PRGs table in 1992, there was concern expressed by DTSC that for some chemicals the risk-based concentrations calculated using Cal/EPA toxicity values were "significantly" more protective than the risk-based PRGs calculated by Region IX. At an interagency meeting comprised of mostly toxicologists, it was agreed that PRG values are at best order-of-magnitude estimates, so that if we assume a logarithmic scale, then a difference greater than 3.3 (½ log above or below) would be considered a significant difference. Therefore, for individual chemicals where California PRG values are significantly more protective than Region IX EPA PRGs, Cal-Modified PRGs are included in the Region IX PRGs table.

The Navy subsequently adopted similar guidance, wherein consideration of DTSC toxicity values is included where significant differences exist between the DTSC and EPA Region IX toxicity value. In response to additional Navy risk assessment guidance (Navy 2002), this HHRA considered DTSC toxicity values where a Cal-modified PRG has been developed, indicating that the underlying toxicity factor was determined by EPA Region IX to be significantly more protective than the federal EPA-recommended toxicity value. In addition, some toxicity values *do* differ by a factor of 4 or more, but the EPA toxicity value is more recent and/or EPA Region IX has not adopted any Cal-modified PRG. Some sites (where use of DTSC toxicity factors would make a significant difference in the risk characterization) may warrant dual tracking of risk results, as determined on a case-by-case basis. This potential is addressed in the uncertainty analysis (see Section 8.3.5).

6.7 TOXICITY PROFILES

Toxicity profiles for COPCs for Sites 9, 13, 19, 22, and 23 are provided in Attachment H3. This toxicity assessment focuses on COPCs, and in particular, the risk drivers for OU-2A, rather than discussing information for all detected chemicals. A summary of toxicity values for any chemical selected as a COPC for at least one site at OU-2A in at least one medium is also provided in Tables H-5.1 through H-6.2.

6.8 TOTAL PETROLEUM HYDROCARBONS

While TPH was sampled and detected in various media at some OU-2A sites, Alameda Point risk assessments follow Superfund and DTSC guidance (DTSC 1993a) in assessing the toxicity of nondiscrete TPH. Specifically, evaluation of TPH is not required for CERCLA assessments in California where the chemical-specific indicator compounds (benzene, toluene, ethylbenzene, and total xylenes (BTEX); lead; and PAHs) are already assessed (DTSC 1993a).

7.0 RISK CHARACTERIZATION

The final step in the HHRA is the characterization of the potential risks associated with exposure to chemicals detected at a site. Noncancer health hazards and cancer risks are characterized separately. The general methodology for estimating HIs and cancer risks is presented in Sections H.7.1 and H.7.2. As indicated previously in Section 6.5, lead is evaluated separately, as

described in Section 7.4. The subsections of Section 7.5 present specific results for the HHRAs that were conducted for Sites 9, 13, 19, 22, and 23.

7.1 CHARACTERIZATION OF NONCANCER HAZARDS

For chemicals that are not classified as carcinogens and for those carcinogens known to cause adverse health effects other than cancer, the potential for exposure to result in adverse health effects other than cancer is evaluated by comparing the intake with an RfD. When calculated for a single chemical, the comparison yields a ratio termed the HQ:

$$Hazard\ Quotient = \frac{Intake\ (mg/kg\text{-}day)}{RfD\ (mg/kg\text{-}day)} \quad (7\text{-}1)$$

To evaluate the potential for adverse health effects other than cancer from simultaneous exposure to multiple chemicals, the HQs for all chemicals are summed, yielding an HI as follows:

$$Hazard\ Index = \sum HQ \quad (7\text{-}2)$$

Pathway-specific HIs are then summed to estimate a total HI for each receptor identified at a site. If the total HI exceeded 1.0, further evaluation in the form of a segregation of HI analysis may be performed to determine whether the noncancer HIs are a concern at a site (EPA 1989).

7.2 CHARACTERIZATION OF CANCER RISKS

Risks associated with exposure to chemicals classified as carcinogens are estimated as the incremental probability that an individual will develop cancer over a lifetime as a direct result of an exposure (EPA 1989). The estimated risk is expressed as a unitless probability.

To aid in the interpretation of the results of the risk assessment, EPA guidance on exposure levels considered protective of human health is presented. In the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), EPA defined general remedial action goals for sites on the National Priorities List (Title 40 of the *Code of Federal Regulations* Part 300.430). The goals include a range for residual carcinogenic risk, which is "an excess upper-bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}," or 1 in 10,000 to 1 in 1,000,000. The goals set out in the NCP are applied once a decision to remediate a site has been made. A more recent EPA directive (EPA 1991b) provides additional guidance on the role of the HHRA in supporting risk management decisions, and in particular, determining whether remedial action is necessary at a site. Specifically, the guidance states, "Where cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the noncancer HQ is less than 1, action generally is not warranted unless there are adverse environmental impacts." EPA Region IX has stated, however, that action may be taken to address risks between 10^{-4} and 10^{-6}. For that reason, the range between 10^{-4} and 10^{-6} is referred to as the "risk management range" in this HHRA.

For chemicals classified as carcinogens, three steps are used in estimating cancer risks. First, to derive a cancer risk estimate for a single chemical and pathway, the chemical intake is multiplied by the chemical-specific SF. The calculation is based on the following relationship:

$$\textit{Chemical-Specific Cancer Risk} = \textit{Intake (mg/kg-day)} \times \textit{SF (mg/kg-day)}^{-1} \quad (7\text{-}3)$$

Second, to estimate the cancer risk associated with exposure to multiple carcinogens for a single exposure pathway, the individual chemical cancer risks are assumed to be additive, as follows:

$$\textit{Pathway-Specific Cancer Risk} = \sum \textit{Chemical-Specific Cancer Risk} \quad (7\text{-}4)$$

Third, pathway-specific risks are summed to estimate the total cancer risk.

7.3 TOTAL RISK VERSUS INCREMENTAL RISK

DTSC has voiced an interest in ensuring that not only incremental risk contributed by Superfund releases and former site operations at Alameda Point are characterized but that total risk (with no risk-based or background screen, such that all detected analytes were included in the risk assessment) is communicated as well. To effectively communicate these differences and continue to follow Navy (2001) guidance that implements risk-based toxicity and background screening steps, the following total risk screening was conducted.

First, all detected contaminants below residential PRGs (and thus not COPCs) were evaluated, and the maximum detected concentration was screened relative to its residential PRG (EPA 2002b). Effectively, this screening is a shortcut (suggested in the Navy tiered guidance [Navy 2001]) that still presents enough information to ensure that human health risks are not being underpredicted by use of a COPC screen on PRGs. Findings of this approach are presented in the subsections of Section 7.5. Results of the total risk evaluation are presented in tabular form in Attachment H4.

7.4 CHARACTERIZING HEALTH EFFECTS ASSOCIATED WITH EXPOSURE TO LEAD

The health effects associated with exposure to lead are unique in nature. Blood lead concentrations were calculated for sites where lead maxima and RME EPC exceeded the residential EPA Region IX PRG of 400 mg/kg or the Cal-modified PRG of 150 mg/kg (EPA 2002b).

Blood lead concentrations were calculated for the applicable receptors from exposures to lead using LeadSpread 7 (DTSC 1999), the DTSC's lead risk assessment tool. LeadSpread estimates intake and corresponding blood lead levels via equations that link incremental blood lead increase to a concentration in an environmental medium. The following exposure pathways are included in the uptake model: dietary intake, drinking water, soil and dust ingestion, inhalation, and dermal contact. Default background or regulatory screening concentrations of lead in media

can be used, or environmental concentrations can be input using site-specific values for the various media. Further, lead concentrations can be set equal to zero if the pathway is not likely to exist, such as ingestion of home-grown produce at OU-2A. Default lead concentrations in the model that remain in the calculations unless changed by the user include the DTSC MCL of 15 µg/L in drinking water, the highest monthly average value from a California monitoring station of 0.028 $\mu g/m^3$ for ambient air, and a respirable dust concentration of 1.5 $\mu g/m^3$, based on soil screening guidance (EPA 1996a). Bioavailability, uptake, and exposure factors used in the model are based on relevant EPA and DTSC guidance and are described in the model technical memorandum.

Not all OU-2A sites had lead as a COPC; therefore, this assessment was not required for most sites. Where included, the assessment follows the cancer and noncancer risk characterization for each site in Section 7.5 in the following text.

7.5 SITE-SPECIFIC RISK CHARACTERIZATION: RISK ASSESSMENT RESULTS

The subsections that follow present specific results for the HHRAs that were conducted for Sites 9, 13, 19, 22, and 23.

7.5.1 Site 9 Risk Characterization

Noncancer hazards and cancer risks calculated for Site 9 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil, soil gas/groundwater (vapor intrusion pathways), and groundwater (domestic use pathways). Noncancer hazards and cancer risks associated with CTE exposures are presented in a separate attachment (see Attachment H2).

Consistent with the exposure assessment (Section 5), both current and future exposures were evaluated for Site 9. Cancer risks and noncancer adverse health effects are summarized in the following text and in formal RAGS Part D-required tables (see Tables H-7.1.1 through H-10.1.7).

7.5.1.1 Current/Future Commercial/Industrial Worker

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 4×10^{-6}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.1). The HI from exposure to surface soil is 0.02, which is less than the risk management HI of 1 for noncarcinogens. All of the risk and hazards are associated with arsenic, which is not considered significantly greater than background at Site 9 (see Section 4.2.4 for overview of background comparison detailed in Appendix A of the RI report).

Groundwater – Vapor Intrusion

The total carcinogenic risk from exposure to groundwater via vapor intrusion is 5×10^{-6}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.1). The majority of this risk (5×10^{-6}) is associated with potential exposure to vinyl chloride, which was detected in 7 of the 44-groundwater samples. The infinite indoor air concentration, however, was based upon the maximum vinyl chloride concentration in groundwater (220 µg/L), which was collected in 1994. The most recent maximum concentration (20 µg/L) collected in 2003 was approximately an order of magnitude lower than the 1994 concentration. If the lower, more recent vinyl chloride concentration is representative of shallow aquifer conditions in 2003 and is used in the vapor intrusion evaluation, the carcinogenic risk level would be lowered by approximately an order of magnitude (7×10^{-7}), which is less than the risk management range of 1×10^{-4} to 1×10^{-6}.

The HI from exposure to groundwater via vapor intrusion is 0.03, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.1.1).

Summary

The total receptor carcinogenic risk from exposure to surface soil and groundwater via vapor intrusion is approximately 9×10^{-6}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.1).

The total receptor noncarcinogenic HI from exposure to surface soil and shallow zone groundwater via vapor intrusion is approximately 0.06, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.1.1).

The uncertainty associated with risk drivers is discussed in Section 11.3.

7.5.1.2 Future Construction Worker

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 4×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.2). The HI from exposure to surface soil is 0.07, which is less than the risk management HI of 1 for noncarcinogens. All of the risk and hazards are associated with arsenic, which is not considered significantly greater than background at Site 9 (see Section 4.2.4 for overview of background comparison detailed in Appendix A).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.1.3 Hypothetical Future Resident

The estimate of cancer risk for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors, whereas the noncancer HI is based on total HI estimated for the child receptor. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 3×10^{-5}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.3 and Table H-9.1.4). The HI from exposure to surface soil is 0.4, which is less than the risk management HI of 1 for noncarcinogens. All of the risk and hazards are associated with arsenic, which is not considered significantly greater than background at Site 9 (see Section 4.2.4 for overview of background comparison detailed in Appendix A of the RI report).

Groundwater – Vapor Intrusion

The total carcinogenic risk from exposure to groundwater via vapor intrusion is 2×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.3 and Table H-9.1.4). The majority of this risk (2×10^{-4}) is associated with potential exposure to vinyl chloride, which was detected in 7 of the 44 groundwater samples. The infinite indoor air concentration, however, was based upon the maximum vinyl chloride concentration in groundwater (220 µg/L), which was collected in 1994. The most recent maximum concentration (20 µg/L), collected in 2003, was approximately an order of magnitude lower than the 1994 concentration. The use of the lower, more recent vinyl chloride concentration in the vapor intrusion evaluation would lower the carcinogenic risk level by approximately an order of magnitude (to 2×10^{-5}), which is within the risk management range of 1×10^{-4} to 1×10^{-6}.

The HI from exposure to groundwater via vapor intrusion is 1.1, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.1.4). Using the lower, more recent vinyl chloride concentration in the vapor intrusion evaluation (see carcinogenic evaluation above) would lower the HI by approximately an order of magnitude (0.2), which is less than the risk management HI of 1 for noncarcinogens.

Groundwater – Domestic Use

The total carcinogenic risk from exposure to groundwater via domestic use is 3×10^{-3}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.3 and B-9.1.4). The majority of this risk (2×10^{-3}) is associated with ingestion of arsenic and vinyl chloride in groundwater. The risk from ingestion of arsenic (8×10^{-4}) was compared to risk from ingestion of ambient concentrations of arsenic to evaluate the potential risk from nonambient sources. Carcinogenic risk from exposure to ambient arsenic concentrations from ingestion of groundwater was 4×10^{-4}; therefore, roughly one-half of the potential carcinogenic risk from ingestion of arsenic in groundwater is attributable to ambient concentrations. Nevertheless, the total carcinogenic risk not attributable to ambient arsenic concentrations is approximately 3×10^{-3}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens.

The HI from exposure to groundwater via domestic use is 130, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.1.4). The majority of the HI (110) is associated with ingestion and inhalation of 2-methylnaphthalene, naphthalene, and 4-methylphenol.

Summary

The total receptor carcinogenic risk from exposure to surface soil, groundwater via vapor intrusion, and groundwater via domestic use is approximately 3×10^{-3}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.3 and B-9.1.4).

The total receptor noncarcinogenic HI from exposure to surface soil, groundwater via vapor intrusion, and groundwater via domestic use is approximately 100 (value rounded to one significant digit), which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.1.4). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.1.4 Future Construction Worker – Intrusive Scenario

Subsurface Soil (0- to 8-foot bgs depth interval)

The total carcinogenic risk from exposure to subsurface soil is 3×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.5). The HI from exposure to subsurface soil is 0.05, which is less than the risk management HI of 1 for noncarcinogens. All of the risk and hazards are associated with arsenic, which is not considered significantly greater than background at Site 9 (see Section 4.2.4 for overview of background comparison detailed in Appendix A of the RI report).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.1.5 Hypothetical Future Resident – Intrusive Scenario

The estimate of cancer risk for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors, whereas the noncancer HI is based on total HI estimated for the child receptor. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

Subsurface Soil (0- to 8-foot bgs depth interval)

The total carcinogenic risk from exposure to subsurface soil is 3×10^{-5}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.6 and Table H-9.1.7). The HI from exposure to surface soil is 0.3, which is less than the risk management HI of 1 for noncarcinogens. All of the risk and hazards are associated with arsenic, which is not considered significantly greater than background at Site 9 (see Section 5.3.4 for overview of background comparison detailed in Appendix A of the RI report).

Groundwater – Vapor Intrusion

The total carcinogenic risk from exposure to groundwater via vapor intrusion is 2×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.3 and Table H-9.1.4). The majority of this risk (2×10^{-4}) is associated with potential exposure to vinyl chloride, which was detected in 7 of the 44-groundwater samples. The infinite indoor air concentration, however, was based upon the maximum vinyl chloride concentration in groundwater (220 µg/L), which was collected in 1994. The most recent maximum concentration (20 µg/L), collected in 2003, was approximately an order of magnitude lower than the 1994 concentration. The use of the lower, more recent vinyl chloride concentration in the vapor intrusion evaluation would lower the carcinogenic risk level by approximately an order of magnitude (2×10^{-5}), which is within the risk management range of 1×10^{-4} to 1×10^{-6}.

The HI from exposure to groundwater via vapor intrusion is 1.1, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.1.4). Using the lower, more recent vinyl chloride concentration in the vapor intrusion evaluation (see carcinogenic evaluation above) would lower the HI by approximately an order of magnitude (0.2), which is less than the risk management HI of 1 for noncarcinogens.

Groundwater – Domestic Use

The total carcinogenic risk from exposure to groundwater via domestic use is 3×10^{-3}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.3 and B-9.1.4). The majority of this risk (2×10^{-3}) is associated with ingestion of arsenic and vinyl chloride in groundwater. The risk from ingestion of arsenic (8×10^{-4}) was compared to risk from ingestion of ambient concentrations of arsenic to evaluate the potential risk from nonambient sources. Carcinogenic risk from exposure to ambient arsenic concentrations from ingestion of groundwater was 4×10^{-4}; therefore, roughly one-half of the potential carcinogenic risk from ingestion of arsenic in groundwater is attributable to ambient concentrations. Nevertheless, the total carcinogenic risk not attributable to ambient arsenic concentrations is approximately 3×10^{-3}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens.

The HI from exposure to groundwater via domestic use is 130, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.1.4). The majority of the HI (100) is associated with ingestion and inhalation of 2-methylnaphthalene, naphthalene, and 4-methylphenol.

Summary

The total receptor carcinogenic risk from exposure to subsurface soil, groundwater via vapor intrusion, and groundwater via domestic use is approximately 3×10^{-3}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.1.3 and H-9.1.4).

The total receptor noncarcinogenic HI from exposure to subsurface soil, groundwater via vapor intrusion, and groundwater via domestic use is approximately 100 (value rounded to one significant digit), which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.1.4). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.1.6 Residential Total Risk Based on Maxima

This total risk evaluation is used to evaluate the potential for underestimating risk in the HHRA associated with the methodology used in the COPC screen (see Section 4). The assumptions used in the total risk evaluation included exposure is based upon a hypothetical resident living at the site with exposure parameters identical to those used to calculate the screening criteria. Every detected analyte not quantitatively evaluated in HHRA was used (that is, all detected analytes except COPCs). The maximum detected concentration was used for subsurface soil (0 to 8 feet bgs) and groundwater (domestic use) evaluations. Screening criteria included Region IX residential soil PRGs and tap water PRGs (EPA 2002a).

Subsurface Soil (0- to 8-foot bgs depth interval)

The potential carcinogenic risk attributed to those analytes not quantified in the risk assessment for subsurface soil is 2×10^{-6}, which is within the risk management range of 1×10^{-4} to 1×10^{-6}

for carcinogens (Attachment Table H4-1). No single analyte, however, exceeds the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens.

The potential noncarcinogenic hazards attributed to those analytes not quantified in the risk assessment for subsurface soil is 1.2, which is greater than the risk management HI of 1 for noncarcinogens (Attachment Table H4-1). The majority of these potential hazards, however, are associated with metals. In particular, the HI associated with aluminum and manganese is 0.77, neither of which was determined to be significantly greater than background (see Appendix A of the RI report).

Groundwater – Domestic Use

The potential carcinogenic risk attributed to those analytes not quantified in the risk assessment for groundwater (potential domestic use) is 4×10^{-7}, which is less than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (Attachment Table H4-2).

The potential noncarcinogenic hazards attributed to those analytes not quantified in the risk assessment for groundwater (potential domestic use) is 5, which is greater than the risk management HI of 1 for noncarcinogens (Attachment Table H4-2). The majority of this HI is associated with exposure to several organics and metals in groundwater. In particular, the HI for aluminum, barium, cadmium, molybdenum, nickel, and vanadium is 2.4; however, only molybdenum was determined to be not significantly greater than background (see Appendix A of the RI report). The remaining HI is due to several organics (acetone, phenanthrene, toluene, and 2,4-dimethylphenol) with low detection frequencies.

Summary

By definition, because all of these maxima were either below their risk-based PRGs or statistically below ambient concentrations at Alameda Point OU-2A, none of these chemicals is a risk driver, and the findings of this residual (non-COPC) risk assessment screen would not change the conclusions of the HHRA. It is concluded that the COPC screen was protective and appropriately followed Navy (2001) guidance.

7.5.1.7 Lead at Site 9

Lead was a groundwater (domestic use) COPC for Site 9, with a maximum concentration of 28.9 µg/L; however, the EPC derived for lead in groundwater was 5.8 µg/L (see Table H-3.5), which is significantly less than the EPA's treatment technique action limit for lead (EPA 2003c). Lead in groundwater at Site 9 will not be forwarded to the FS.

7.5.2 Site 13 Risk Characterization

Noncancer hazards and cancer risks calculated for Site 13 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil, and groundwater (domestic use pathways). Noncancer hazards and cancer risks associated with CTEs are presented in a separate attachment (see Attachment H2).

Consistent with the exposure assessment (Section 5.0), both current and future exposures were evaluated for Site 13. Cancer risks and noncancer adverse health effects are summarized in the following text and in formal RAGS Part D-required tables (see Table H-7.2.1 through H-10.2.7).

7.5.2.1 Current/Future Commercial/Industrial Worker

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 7×10^{-6}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.2.1). The majority of this risk (6×10^{-6}) is associated with incidental ingestion and dermal contact with arsenic. Also, arsenic is the only analyte that had an exposure medium total (adding all exposure pathways) greater than the 1×10^{-6} for carcinogens. Arsenic was considered significantly greater than background at Site 13 (see Section 4.2.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to surface soil is 0.04, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.2.1).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted above.

7.5.2.2 Future Construction Worker

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 8×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.2.2).

The HI from exposure to surface soil is 0.1, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.2.2).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.2.3 Hypothetical Future Resident

The estimate of cancer risk for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors, whereas the noncancer HI is based on total HI estimated for the child receptor. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 6×10^{-5}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.2.3 and Table H-9.2.4). The majority of this risk (6×10^{-5}) is associated with incidental ingestion and dermal contact with arsenic, and ingestion of arsenic in homegrown produce. Arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene were the only analytes that had an exposure medium total (adding all exposure pathways) greater than 1×10^{-6}. Arsenic was considered significantly greater than background at Site 13 (see Section 4.5.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to surface soil is 0.6, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.2.4).

Groundwater – Domestic Use

The total carcinogenic risk from exposure to groundwater via domestic use is 7×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Tables H-9.2.3 and H-9.2.4). The majority of this risk (6×10^{-4}) is associated with ingestion of arsenic in groundwater, which was not considered significantly greater than background for Site 13. Nevertheless, the total carcinogenic risk not attributable to arsenic concentrations is approximately 3×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens. The majority of this remaining risk (2×10^{-5}) is associated with dermal contact with pentachlorophenol, which was detected in only 2 of the 35 groundwater samples. Carcinogenic risk from dermal contact with pentachlorophenol was calculated using a predicted dermal permeability constant (0.39 cm/hour) for pentachlorophenol, which was adopted from EPA draft RAGS Part E (2001b), was determined by EPA to be outside the effective prediction domain for predicting permeability constants; the uncertainty associated with this value may result in a slight underestimation or overestimation of risks. In addition, detection of pentachlorophenol by standard EPA methodology can be highly variable, as noted in EPA's introduction to the SW-846 methods manual for Method 8270 (EPA 1992b).

The HI from exposure to groundwater via domestic use is 31, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.2.4). The majority of the HI (30) is associated with ingestion of arsenic, manganese, and thallium. Only manganese was considered significantly greater than background; however, it may have increased solubility as a result of reducing conditions that are caused by natural attenuation of organic compounds in groundwater. The HI associated with exposure to groundwater that is not related to these four inorganic compounds is approximately 1.3, which is slightly greater than the risk management HI of 1 for noncarcinogens (see Table H-9.2.4).

Summary

The total receptor carcinogenic risk from exposure to surface soil and groundwater via domestic use is approximately 7×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.2.3 and H-9.2.4).

The total receptor noncarcinogenic HI from exposure to surface soil and groundwater via domestic use is approximately 30 (value rounded to one significant digit), which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.2.4). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.2.4 Future Construction Worker – Intrusive Scenario

Subsurface Soil (0- to 8-foot bgs depth interval)

The total carcinogenic risk from exposure to subsurface soil is 6×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.2.5).

The HI from exposure to surface soil is 0.2, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.2.5).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.2.5 Hypothetical Future Resident – Intrusive Scenario

The estimate of cancer risk for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors, whereas the noncancer HI is based on total HI estimated for the child receptor. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

Subsurface Soil (0- to 8-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 4×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.2.6 and Table H-9.2.7). The majority of this risk (4×10^{-5}) is associated with incidental ingestion and dermal contact with arsenic, and ingestion of arsenic in homegrown produce. Arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene were the only analytes that had an exposure medium total (adding all exposure pathways) greater than 1×10^{-6}. Arsenic was considered significantly greater than background at Site 13 (see Section 4.5.4 for overview of background comparison detailed in Appendix A of the RI report.).

The HI from exposure to surface soil is 0.7, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.2.7).

Groundwater – Domestic Use

The total carcinogenic risk from exposure to groundwater via domestic use is 7×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.2.6 and H-9.2.7). The majority of this risk (6×10^{-4}) is associated with ingestion of arsenic in groundwater, which was not considered significantly greater than background for Site 13. Nevertheless, the total carcinogenic risk not attributable to arsenic concentrations is approximately 3×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens. These risks are highly uncertain because of the contribution of pentachlorophenol, however, as explained in Section 7.5.2.3.

The HI from exposure to groundwater via domestic use is 31, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.2.7). The majority of the HI (30) is associated with ingestion of arsenic, manganese, and thallium. Only manganese was considered significantly greater than background; however, it may have increased solubility because of reducing conditions promulgated by natural attenuation of organic compounds in groundwater. The HI associated with exposure to groundwater that is not related to these four inorganic compounds is approximately 1.3, which is slightly greater than the risk management HI of 1 for noncarcinogens (see Table H-9.2.7).

Summary

The total receptor carcinogenic risk from exposure to surface soil and groundwater via domestic use is approximately 7×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.2.6 and H-9.2.7).

The total receptor noncarcinogenic HI from exposure to surface soil and groundwater via domestic use is approximately 30 (value rounded to one significant digit), which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.2.7). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.2.6 Residential Total Risk Based on Maxima

This total risk evaluation was conducted as for Section 7.5.1.6.

Subsurface Soil (0- to 8-foot bgs depth interval)

The potential carcinogenic risk attributed to those analytes not quantified in the risk assessment for subsurface soil is 1×10^{-6}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (Attachment Table H4-3). No single analyte, however, exceeds the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens.

The potential noncarcinogenic hazards attributed to those analytes not quantified in the risk assessment for subsurface soil is 3.2, which is greater than the risk management HI of 1 for noncarcinogens (Attachment Table H4-3). The majority of this HI (2.4), however, is associated with metals (aluminum, antimony, manganese, cadmium nickel, thallium, and zinc), of which, only antimony and zinc were considered significantly greater than background. The remaining HI is associated with a few organic compounds (1,2,4-trimethylbenzene, naphthalene, and xylene) in subsurface soil.

Groundwater – Domestic Use

The potential carcinogenic risk attributed to those analytes not quantified in the risk assessment for groundwater (potential domestic use) is 2×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (Attachment Table H4-4).

The potential noncarcinogenic hazards attributed to those analytes not quantified in the risk assessment for groundwater (potential domestic use) is 1.0, which is not greater than the risk management HI of 1 for noncarcinogens (Attachment Table H4-4). No single analyte has an HQ greater than 0.2 in groundwater.

Summary

By definition, because all of these maxima were either below their risk-based PRGs or statistically below ambient concentrations at Alameda Point OU-2A, none of these chemicals is a risk driver, and the findings of this residual (non-COPC) risk assessment screen would not change the conclusions of the HHRA. It is concluded that the COPC screen was protective and appropriately followed Navy (2001) guidance.

7.5.2.7 Lead at Site 13

Although lead was selected as a COPC because the maximum individual point for lead (431 mg/kg) exceeded 150 mg/kg (the Cal-modified PRG for lead) and the residential EPA Region IX PRG (400 mg/kg), the exposure point concentration for lead (139 mg/kg in surface

soil and 54.7 in subsurface soil) did not exceed the Cal-modified residential PRG (EPA 2002b). This suggests that no receptor would have unacceptable blood lead levels associated with exposure to soils (that is, there is no potential for unacceptable effects).

7.5.3 Site 19 Risk Characterization

Noncancer hazards and cancer risks calculated for Site 19 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil, and groundwater (domestic use pathways). Noncancer hazards and cancer risks associated with CTEs are presented in a separate attachment (see Attachment H2).

Consistent with the exposure assessment (Section 7), both current and future exposures were evaluated for Site 13. Cancer risks and noncancer adverse health effects are summarized in the following text and in formal RAGS Part D-required tables (see Table H-7.3.1 through H-10.3.7).

7.5.3.1 Current/Future Commercial/Industrial Worker

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 6×10^{-6}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.3.1). The majority of this risk (6×10^{-6}) is associated with incidental ingestion and dermal contact with arsenic. Also, arsenic is the only analyte that had an exposure medium total (adding all exposure pathways) greater than the 1×10^{-6} for carcinogens. Arsenic is not considered significantly greater than background at Site 19 (see Section 4.2.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to surface soil is 0.03, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.3.1).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.3.2 Future Construction Worker

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 7.1×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.3.2).

The HI from exposure to surface soil is 0.10, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.3.2).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.3.3 Hypothetical Future Resident

The estimate of cancer risk for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors, whereas the noncancer HI is based on total HI estimated for the child receptor. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 5×10^{-5},, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.3.3 and Table H-9.3.4). The majority of this risk (5×10^{-5}) is due to incidental ingestion and dermal contact with arsenic, and ingestion of arsenic in homegrown produce. Arsenic and benzo(a)pyrene are the only analytes that had an exposure medium total (adding all exposure pathways) greater than 1×10^{-6} for carcinogens. Arsenic is not considered significantly greater than background at Site 19 (see Section 4.2.4 for overview of background comparison detailed in Appendix D).

The HI from exposure to surface soil is 0.6, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.3.4).

Groundwater – Domestic Use

The total carcinogenic risk from exposure to groundwater via domestic use is 2×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.3.3 and B-9.3.4). The majority of this risk (2×10^{-4}) is associated with ingestion of arsenic in groundwater, which was not considered significantly greater than background for Site 19. Nevertheless, the total carcinogenic risk not attributable to arsenic concentrations is approximately 2×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens. The majority of this remaining risk is associated with exposure to PCE and TCE, which were detected in less than half (10 of 28) the groundwater samples.

The HI from exposure to groundwater via domestic use is 17, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.3.4). The majority of the HI is associated with ingestion of arsenic (2.0) and ingestion of manganese (14); of these, only

manganese is considered significantly greater than background in groundwater. These two analytes, however, may have increased solubility because of reducing conditions perpetuated by natural attenuation of organic compounds in groundwater. The HI associated with exposure to groundwater that is not related to these two inorganic compounds is approximately 0.7, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.3.4).

Summary

The total receptor carcinogenic risk from exposure to surface soil and groundwater via domestic use is approximately 3×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.3.3 and H-9.3.4).

The total receptor noncarcinogenic HI from exposure to surface soil and groundwater via domestic use is approximately 20 (value rounded to one significant digit), which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.3.4). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.3.4 Future Construction Worker – Intrusive Scenario

Subsurface Soil (0- to 8-foot bgs depth interval)

The total carcinogenic risk from exposure to subsurface soil is 6×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.3.5).

The HI from exposure to surface soil is 0.09, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.3.5).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.3.5 Hypothetical Future Resident – Intrusive Scenario

The estimate of cancer risk for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors, whereas the noncancer HI is based on total HI estimated for the child receptor. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

Subsurface Soil (0- to 8-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 5×10^{-5}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.3.6 and Table H-9.3.7). The majority of this risk (5×10^{-5}) is associated with incidental ingestion and dermal contact with arsenic, and ingestion of homegrown produce. Arsenic and benzo(a)pyrene were the only analytes that had an exposure medium total (adding all exposure pathways) greater than 1×10^{-6} for carcinogens. Arsenic was not considered significantly greater than background at Site 19 (see Section 4.3.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to surface soil is 0.5, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.3.7).

Groundwater – Domestic Use

The total carcinogenic risk from exposure to groundwater via domestic use is 2×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.3.6 and B-9.3.7). The majority of this risk (2×10^{-4}) is associated with ingestion of arsenic in groundwater, which was not considered significantly greater than background for Site 19. Nevertheless, the total carcinogenic risk not attributable to arsenic concentrations is approximately 2×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens. The majority of this remaining risk is associated with exposure to PCE and TCE, which were detected in less than half (10 of 28) the groundwater samples.

The HI from exposure to groundwater via domestic use is 17, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.3.6). The majority of the HI is associated with ingestion of arsenic (2.0) and ingestion of manganese (14); of these only manganese is considered significantly greater than background in groundwater. These two analytes, however, may have increased solubility as a result of reducing conditions promulgated by natural attenuation of organic compounds in groundwater. The HI associated with exposure to groundwater that is not related to these two inorganic compounds is approximately 0.7, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.3.7).

Summary

The total receptor carcinogenic risk from exposure to surface soil and groundwater via domestic use is approximately 3×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.3.6 and H-9.3.7).

The total receptor noncarcinogenic HI from exposure to surface soil, groundwater via vapor intrusion, and groundwater via domestic use is approximately 20 (value rounded to one significant digit), which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.3.7). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.3.6 Residential Total Risk Based on Maxima

This total risk evaluation was conducted as for Section 7.5.1.6.

Subsurface Soil (0- to 8-foot bgs depth interval)

The potential carcinogenic risk attributed to those analytes not quantified in the risk assessment for subsurface soil is 4×10^{-6}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (Attachment Table H4-5). No single analyte exceeds the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens.

The potential noncarcinogenic hazards attributed to those analytes not quantified in the risk assessment for subsurface soil is 1.8, which is greater than the risk management HI of 1 for noncarcinogens (Attachment Table H4-5). The majority of these potential hazards are associated with metals. In particular, the HI associated with manganese and thallium is 1.1, which was not determined to be significantly greater than background (see Appendix A of the RI report).

Groundwater – Domestic Use

The potential carcinogenic risk attributed to those analytes not quantified in the risk assessment for groundwater (potential domestic use) is 5×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (Attachment Table H4-6).

The potential noncarcinogenic hazards attributed to those analytes not quantified in the risk assessment for groundwater (potential domestic use) is 2.0, which is greater than the risk management HI of 1 for noncarcinogens (Attachment Table H4-6). The majority of this HI is associated with exposure to antimony (0.84) and antimony (0.13) concentrations in groundwater, both of which were determined to be significantly greater than background (see Appendix D). The remaining hazards are mostly associated with organic compounds such as naphthalene with an HQ of 0.35.

Summary

By definition, because all of these maxima were either below their risk-based PRGs or statistically below ambient concentrations at Alameda Point at OU-2A, none of these chemicals is a risk driver, and the findings of this residual (non-COPC) risk assessment screen would not change the conclusions of the HHRA. It is concluded that the COPC screen was protective and appropriately followed Navy (2001) guidance.

7.5.3.7 Lead at Site 19

Although lead was selected as a COPC in subsurface soil because the maximum individual point for lead (303 mg/kg) exceeded 150 mg/kg (the Cal-modified PRG for lead) and the residential

EPA Region IX PRG (400 mg/kg), the EPC for lead (55 mg/kg in subsurface soil) did not exceed the Cal-modified residential PRG (EPA 2002a). This suggests that no receptor would have unacceptable blood lead levels because of exposure to soils (that is, there is no potential for unacceptable effects).

7.5.4 Site 22 Risk Characterization

Noncancer hazards and cancer risks calculated for Site 22 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil, soil gas/groundwater (vapor intrusion pathways), and groundwater (domestic use pathways). Noncancer hazards and cancer risks associated with CTEs are presented in a separate attachment (see Attachment H2).

Soil and groundwater data representing saturated soils and groundwater with product sheen (that is, a nonaqueous layer) were collected and analyzed at Site 22. These data are problematic for risk assessment because they are not representative of site-wide baseline conditions but rather represent a hot spot of contamination. These areas are being addressed via remediation under the corrective action program and an FS is underway to determine the exact method for remediation; therefore, these hot spot data are not included in the HHRA. Risks and hazards presented below are based upon fringe product concentrations.

Consistent with the exposure assessment (Section 7), both current and future exposures were evaluated for Site 22. Cancer risks and noncancer adverse health effects are summarized in the following text and in formal RAGS Part D-required tables (see Table H-7.4.1 through H-10.4.7).

7.5.4.1 Current/Future Commercial/Industrial Worker

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 7×10^{-6}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.1). The majority of this risk (7×10^{-6}) is associated with incidental ingestion and dermal contact with arsenic. Also, arsenic is the only analyte that had an exposure medium total (adding all exposure pathways) greater than the 1×10^{-6} for carcinogens. Arsenic is not considered significantly greater than background at Site 22 (see Section 4.5.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to surface soil is 0.04, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.4.1).

Groundwater – Vapor Intrusion

The total carcinogenic risk from exposure to groundwater via vapor intrusion is 3×10^{-6}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.1).

The HI from exposure to groundwater via vapor intrusion is 0.06, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.4.1).

Summary

The total receptor carcinogenic risk from exposure to surface soil and groundwater via vapor intrusion is approximately 1×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.1).

The total receptor noncarcinogenic HI from exposure to surface soil and shallow zone groundwater via vapor intrusion is approximately 0.1, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.4.1). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.4.2 Future Construction Worker

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 8×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.2).

The HI from exposure to surface soil is 0.1, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.4.2).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.4.3 Hypothetical Future Resident

The estimate of cancer risk for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors, whereas the noncancer HI is based on total HI estimated for the child receptor. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 6×10^{-5}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.3 and Table H-9.4.4). The majority of this risk (6×10^{-5}) is associated with incidental ingestion and dermal contact

with arsenic. Arsenic and benzo(a)pyrene were the only analytes that had an exposure medium total (adding all exposure pathways) greater than the 1×10^{-6} for carcinogens. Arsenic was not considered significantly greater than background at Site 22 (see Section 4.2.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to surface soil is 0.7, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.4.4).

Groundwater – Vapor Intrusion

The total carcinogenic risk from exposure to groundwater via vapor intrusion is 6×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.3 and Table H-9.4.4).

The HI from exposure to groundwater via vapor intrusion is 1.9, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.4.4).

Groundwater – Domestic Use

The total carcinogenic risk from exposure to groundwater via domestic use is 3×10^{-3}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.3 and H-9.4.4). The majority of this risk is associated with ingestion of arsenic and benzene in groundwater. Arsenic was considered significantly greater than background at Site 22 (see Section 4.2.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to groundwater via domestic use is 83, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.4.4). The majority of the HI is associated with ingestion and inhalation of benzene and manganese.

Summary

The total receptor carcinogenic risk from exposure to surface soil, groundwater via vapor intrusion, and groundwater via domestic use is approximately 3×10^{-3}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.3 and B-9.4.4).

The total receptor noncarcinogenic HI from exposure to surface soil, groundwater via vapor intrusion, and groundwater via domestic use is approximately 90 (value rounded to one significant digit), which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.4.4). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.4.4 Future Construction Worker – Intrusive Scenario

The total carcinogenic risk from exposure to subsurface soil is 9×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.5).

The HI from exposure to subsurface soil is 0.8, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.4.5).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.4.5 Hypothetical Future Resident – Intrusive Scenario

The estimate of cancer risk for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors, whereas the noncancer HI is based on total HI estimated for the child receptor. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

Subsurface Soil (0- to 8-foot bgs depth interval)

The total carcinogenic risk from exposure to subsurface soil is 6×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.6 and Table H-9.4.7). The majority of this risk (4×10^{-5}) is due to incidental ingestion and dermal contact with arsenic and ingestion of arsenic in homegrown produce, and inhalation of VOCs from subsurface soils . Arsenic, benzene, benzo(a)pyrene, and ethylbenzene are the only analytes that have an exposure medium total (adding all exposure pathways) greater than 1×10^{-6} for carcinogens. Arsenic is not considered significantly greater than background at Site 22 (see Section 4.2.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to subsurface soil is 2.9, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.4.7). The majority of the risk (1.8) is associated with inhalation of xylenes from subsurface soils.

Groundwater – Vapor Intrusion

The total carcinogenic risk from exposure to groundwater via vapor intrusion is 6×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.6 and Table H-9.4.7).

The HI from exposure to groundwater via vapor intrusion is 1.9, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.4.7).

Groundwater – Domestic Use

The total carcinogenic risk from exposure to groundwater via domestic use is 3×10^{-3}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.6 and B-9.4.7). The majority of this risk is associated with ingestion of arsenic and benzene in groundwater. Arsenic was considered significantly greater than background at Site 22 (see Section 4.5.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to groundwater via domestic use is 83, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.4.7). The majority of the HI is associated with ingestion and inhalation of benzene and manganese.

Summary

The total receptor carcinogenic risk from exposure to surface soil, groundwater via vapor intrusion, and groundwater via domestic use is approximately 3×10^{-3}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.4.6 and B-9.4.7).

The total receptor noncarcinogenic HI from exposure to surface soil, groundwater via vapor intrusion, and groundwater via domestic use is approximately 90 (value rounded to one significant digit), which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.4.7). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.4.6 Residential Total Risk Based on Maxima

This total risk evaluation was conducted as for Section 7.5.1.6.

Subsurface Soil (0- to 8-foot bgs depth interval)

The potential carcinogenic risk attributed to those analytes not quantified in the risk assessment for subsurface soil is 4×10^{-6}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (Attachment Table H4-7). No single analyte, however, exceeds the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens.

The potential noncarcinogenic hazards attributed to those analytes not quantified in the risk assessment for subsurface soil is 1.8, which is greater than the risk management HI of 1 for noncarcinogens (Attachment Table H4-7). The majority of these potential hazards are associated with a few inorganic compounds (aluminum, cadmium, manganese, and vanadium) totaling an HI of 0.83; only manganese and vanadium were determined to be significantly greater than

background (see Appendix D). The remaining hazards are mostly associated with organic compounds such as naphthalene with an HQ of 0.61.

Groundwater – Domestic Use

The potential carcinogenic risk attributed to those analytes not quantified in the risk assessment for shallow zone groundwater (potential domestic use) is 9×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (Attachment Table H4-8).

The potential noncarcinogenic hazards attributed to those analytes not quantified in the risk assessment for shallow zone groundwater (potential domestic use) is 1.5, which is greater than the risk management HI of 1 for noncarcinogens (Attachment Table H4-8). The majority of this HI is associated with exposure to several organic compounds (for example, tert-butanol and isopropylbenzene) and metals (for example, antimony and cadmium) in groundwater.

Summary

By definition, because all of these maxima were either below their risk-based PRGs or statistically below ambient concentrations at Alameda Point at OU-2A, none of these chemicals is a risk driver, and the findings of this residual (non-COPC) risk assessment screen would not change the conclusions of the HHRA. The COPC screen was protective and appropriately followed Navy (2001) guidance.

7.5.4.7 Lead at Site 22

As noted in Section 7.4, the health effects associated with exposure to lead are unique in nature. Since only a single reported sample contained lead in excess of the Region IX residential PRG for lead of 400 mg/kg or the Cal-modified PRG of 150 mg/kg (EPA 2002b), the site-wide EPC is heavily skewed toward this outlier. Because no current residential exposures occur at Site 22, the evaluation was performed on the 0- to 8-foot bgs data set for the future residential scenario. Only the following one individual detected concentrations of lead exceeded the Cal-modified residential PRG of 150 mg/kg: lead was detected in 1990 at an estimated 9,980 mg/kg in location MW547-5. Because of the skewed data, this lead maximum was a hot spot. For that reason, risk managers may prefer to address this hot spot individually, rather than including it in a site-wide EPC.

Evaluation of the RME EPC that included the hot spot (1,520 mg/kg) for lead was conducted. The RME EPC is the statistical UCL_{95} (including the hot spot of 9,980 mg/kg) lead concentration at Site 22 in the 0- to 8-foot bgs interval, representing the possible future soil to which a future resident or child would be exposed if the site were redeveloped.

Using default values and the RME EPC (including the 9,980 mg/kg maximum) for lead in site soil for Site 22, blood lead concentrations of less than 10 micrograms per deciliter (µg/dL) were estimated for the adult resident, up to and including the 99th percentile, indicating that both adult

workers and residents would not be at risk from site-wide concentrations of lead (even including the outlying maximum). The 50th through the 99th percentile blood lead concentrations for the future child resident, however, ranged from 12.3 µg/dL to 36.8 µg/dL, suggesting that lead concentrations in soil would produce concentrations higher than the 10 µg/dL "bright line" for this receptor if the child were exposed to the RME EPC (including the outlying maximum) for lead. The model also calculates blood lead concentrations for child residents under the assumption that the child engages in pica activities in which the child ingests a large amount of soil. Under the pica assumption, estimated blood lead concentrations for the 50th through the 99th percentile of the median range from 23.0 µg/dL to 68.8 µg/dL.

When the outlying Site 22 maximum of 9,980 mg/kg lead is removed from the data set by virtue of the fact that all other points are below the Cal-modified residential PRG of 150 mg/kg (with the second highest lead result of 67.8 mg/kg), the RME EPC drops from 1,520 mg/kg to 20.1 mg/kg. This is based on the fact that the data set (when the outlying maximum is removed) appears visually lognormal when graphed using Microsoft® Excel Analyse-It statistical software. Thus, the H-statistic is calculated (using half the detection limit for nondetects) and 20.1 mg/kg is the RME EPC when the outlier is removed. Leadspread evaluation would not then be required because all individual concentrations (as well as the RME EPC) without the maximum are below even the Cal-modified residential PRG of 150 mg/kg.

It was concluded that the hot spot of 9,980 mg/kg in location MW547-5 at Site 22 poses an unacceptable risk to future child residents; without this estimated sample result in the data set, risks to all receptors (including future child residents) are acceptable, as all other concentrations are below the Cal-modified PRG of 150 mg/kg.

7.5.5 Site 23 Risk Characterization

Noncancer hazards and cancer risks calculated for Site 23 media are summarized in this section on a media-by-media basis, including surface soil, subsurface soil, and groundwater (domestic use pathways). Noncancer hazards and cancer risks associated with CTEs are presented in a separate attachment (see Attachment H2).

Soil and groundwater data representing saturated soils and groundwater with product sheen (that is, a nonaqueous layer) were collected and analyzed at Site 23. These data are problematic for risk assessment because they are not representative of site-wide baseline conditions but rather represent a hot spot of contamination. These areas are being addressed by remediation under the corrective action program and an FS is underway to determine the exact method for remediation; therefore, these hot spot data are not included in the HHRA. Risks and hazards presented below are based upon fringe product concentrations.

Consistent with the exposure assessment (Section 7.0), both current and future exposures were evaluated for Site 23. Cancer risks and noncancer adverse health effects are summarized in the following text and in formal RAGS Part D-required tables (see Table H-7.5.1 through H-10.5.7).

7.5.5.1 Current/Future Commercial/Industrial Worker

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 4×10^{-6}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.5.1). The majority of this risk (3×10^{-6}) is associated with incidental ingestion and dermal contact with arsenic. Also, arsenic is the only analyte that had an exposure medium total (adding all exposure pathways) greater than the 1×10^{-6} for carcinogens. Arsenic was considered significantly greater than background at Site 23 (see Section 4.5.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to surface soil is 0.02, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.5.1).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.5.2 Future Construction Worker

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 4×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.5.2).

The HI from exposure to surface soil is 0.05, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.5.2).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.5.3 Hypothetical Future Resident

The estimate of cancer risk for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors, whereas the noncancer HI is based on total HI

estimated for the child receptor. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

Surface Soil (0- to 2-foot bgs depth interval)

The total carcinogenic risk from exposure to surface soil is 3×10^{-5}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.5.3 and Table H-9.5.4). The majority of this risk (2×10^{-5}) is associated with incidental ingestion and dermal contact with arsenic and ingestion of arsenic in homegrown produce. Arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene were the only analytes that had an exposure medium total (adding all exposure pathways) greater than the 1×10^{-6} for carcinogens. Arsenic was considered significantly greater than background at Site 23 (see Section 4.5.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to surface soil is 0.3, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.5.4).

Groundwater – Domestic Use

The total carcinogenic risk from exposure to groundwater from domestic use is 6×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.5.3 and H-9.5.4). The majority of this risk (6×10^{-4}) is associated with ingestion of arsenic and benzo(a)pyrene in groundwater. The portion of carcinogenic risk attributed to arsenic was 3×10^{-4}; however, arsenic was considered not significantly greater than background. The remaining carcinogenic risk not attributable to arsenic (4×10^{-4}) is mostly associated with ingestion and dermal contact with benzo(a)pyrene in groundwater (3×10^{-4}), which was detected in 1 of 20 groundwater samples. The single sample was collected from a hydropunch well, which should be given less consideration because of reliability and replicability concerns associated with hydropunch samples. The total carcinogenic risk not attributable to arsenic or benzo(a)pyrene concentrations is approximately 4×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens.

The HI from exposure to groundwater via domestic use is 15, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.5.4). The majority of the HI is associated with ingestion of arsenic and thallium as well as inhalation of VOCs from groundwater. Arsenic and thallium are not considered significantly greater than ambient concentrations in groundwater; nevertheless, the HI not related to arsenic and thallium in groundwater is 10, which is greater than the risk management HI of 1 for noncarcinogens. The majority of this remaining HI is associated with ingestion of sec-butylbenzene (1.4), inhalation of 1,2,4-trimethylbenzene (2.65), and inhalation of naphthalene (2.8) from groundwater.

Summary

The total receptor carcinogenic risk from exposure to surface soil and groundwater from domestic use is approximately 6×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.5.3 and H-9.5.4).

The total receptor noncarcinogenic HI from exposure to surface soil and groundwater via domestic use is approximately 20 (value rounded to one significant digit), which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.5.4). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.5.4 Future Construction Worker – Intrusive Scenario

Subsurface Soil (0- to 8-foot bgs depth interval)

The total carcinogenic risk from exposure to subsurface soil is 4×10^{-7}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.5.5).

The HI from exposure to surface soil is 0.05, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.5.5).

Summary

No other exposure pathways were complete or evaluated for this receptor, so the total receptor carcinogenic risk and total receptor noncarcinogenic HI are equal to the total carcinogenic risk and HI noted previously.

7.5.5.5 Hypothetical Future Resident – Intrusive Scenario

The estimate of cancer risk for the future residential exposure scenario is the sum of the risks estimated for the child and adult receptors, whereas the noncancer HI is based on total HI estimated for the child receptor. Childhood noncancer risks are always higher than adult noncancer risks, given a child's higher intake per unit body mass.

Subsurface Soil (0- to 8-foot bgs depth interval)

The total carcinogenic risk from exposure to subsurface soil is 1×10^{-5}, which is within risk the management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.5.6 and Table H-9.5.7). The majority of this risk (1×10^{-5}) is associated with incidental ingestion and dermal contact with arsenic. Arsenic was the only analyte that had an exposure medium total (adding all exposure pathways) greater than the 1×10^{-6} for carcinogens. Arsenic was not considered significantly greater than background at Site 23 (see Section 4.5.4 for overview of background comparison detailed in Appendix A of the RI report).

The HI from exposure to subsurface soil is 0.3, which is less than the risk management HI of 1 for noncarcinogens (see Table H-9.5.7).

Groundwater – Domestic Use

The total carcinogenic risk from exposure to groundwater from domestic use is 6×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.5.6 and H-9.5.7). The majority of this risk (6×10^{-4}) is associated with ingestion of arsenic and benzo(a)pyrene in groundwater. The portion of carcinogenic risk attributed to arsenic was 2.6×10^{-4}; however, arsenic was considered not significantly greater than background. The remaining carcinogenic risk not attributable to arsenic (4×10^{-4}) is mostly associated with ingestion and dermal contact with benzo(a)pyrene in groundwater (3×10^{-4}), which was detected in 1 of 20 groundwater samples. The single sample was collected from a hydropunch well, which should be given less consideration because of reliability and replicability concerns associated with hydropunch samples. The total carcinogenic risk not attributable to arsenic or benzo(a)pyrene concentrations is approximately 4×10^{-5}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens.

The HI from exposure to groundwater from domestic use is 15, which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.5.7). The majority of the HI is associated with ingestion of arsenic and thallium as well as inhalation of VOCs from groundwater. Arsenic and thallium are not considered significantly greater than ambient concentrations in groundwater; nevertheless, the HI not related to arsenic and thallium in groundwater is 10, which is greater than the risk management HI of 1 for noncarcinogens. The majority of this remaining HI is associated with ingestion of sec-butylbenzene (1.4), inhalation of 1,2,4-trimethylbenzene (2.65), and inhalation of naphthalene (2.8) from groundwater.

Summary

The total receptor carcinogenic risk from exposure to surface soil and groundwater via domestic use is approximately 6×10^{-4}, which is greater than the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (see Table H-9.5.6 and H-9.5.7).

The total receptor noncarcinogenic HI from exposure to surface soil and groundwater from domestic use is approximately 20 (value rounded to one significant digit), which is greater than the risk management HI of 1 for noncarcinogens (see Table H-9.5.7). The uncertainty associated with risk drivers is discussed in Section 8.3.

7.5.5.6 Residential Total Risk Based on Maxima

This total risk evaluation was conducted as for Section 7.5.1.6.

Subsurface Soil (0- to 8-foot bgs depth interval)

The potential carcinogenic risk attributed to those analytes not quantified in the risk assessment for subsurface soil is 4×10^{-6}, which is within the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (Attachment Table H4-9). Other than toxaphene, however, with a carcinogenic risk level of 3×10^{-6}, no single analyte exceeds the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens. Toxaphene was excluded in the COPC screen because it was infrequently detected (1 of 21 samples); it is considered a pesticide that is most likely related to acceptable use of pesticides at the time of deposition; and it is not related to any historical processes at the site. The exclusion of this analyte does not detract from the protectiveness nor would it change the results and conclusions of the risk assessment.

The potential noncarcinogenic hazards attributed to those analytes not quantified in the risk assessment for subsurface soil is 2.1, which is greater than the risk management HI of 1 for noncarcinogens (Attachment Table H4-9). Although the majority of these potential hazards are associated with aluminum (0.28), antimony (0.15), cadmium (0.27), manganese (0.23), thallium (0.63), and vanadium (0.15), only antimony was determined to be significantly greater than background (see Appendix A of the RI report). The remaining hazards are mostly associated with organic compounds such as naphthalene with an HQ of 0.21.

Groundwater – Domestic Use

The potential carcinogenic risk attributed to those analytes not quantified in the risk assessment for shallow zone groundwater (potential domestic use) is 2×10^{-8}, which is less the risk management range of 1×10^{-4} to 1×10^{-6} for carcinogens (Attachment Table H4-10).

The potential noncarcinogenic hazards attributed to those analytes not quantified in the risk assessment for shallow zone groundwater (potential domestic use) is 1.6, which is greater than the risk management HI of 1 for noncarcinogens (Attachment Table H4-10). The majority of this HI is associated with exposure to aluminum (0.11), barium (0.15), mercury (0.15), manganese (0.60), and vanadium (0.12) in groundwater. With the exception of mercury, all were determined to be significantly greater than background (see Appendix A of the RI report).

Summary

By definition, because all of these maxima were either below their risk-based PRGs or statistically below ambient concentrations at Alameda Point at OU-2A, none of these chemicals is a risk driver, and the findings of this residual (non-COPC) risk assessment screen would not change the conclusions of the HHRA. It is concluded that the COPC screen was protective and appropriately followed Navy (2001) guidance.

8.0 UNCERTAINTY DISCUSSION

There are varying degrees of uncertainty at each stage of the HHRA arising from assumptions made in the risk assessment and limitations of the data used to calculate risk estimates. Uncertainty and variability are inherent in the exposure assessment, toxicity values, and risk characterization. EPA guidance (1989) states (emphasis from the original):

> There are several categories of uncertainties associated with site risk assessments. One is the initial selection of substances used to characterize exposures and risk on the basis of the sampling data and available toxicity information. Other sources of uncertainty are inherent in the toxicity values for each substance used to characterize risk. Additional uncertainties are inherent in the exposure assessment for individual substances and individual exposures. These uncertainties are usually driven by uncertainty in the chemical monitoring data and the models used to estimate exposure concentrations in the absence of monitoring data, but can also be driven by population intake parameters. Finally, additional uncertainties are incorporated in the risk assessment when exposures to several substances across multiple pathways are summed.

EPA defines uncertainty as a "lack of knowledge about specific factors, parameters or models" including "parameter uncertainty (measurement errors, sampling errors, and systematic errors), model uncertainty (uncertainty associated with necessary simplification of real-world processes, mis-specification of the model structure, model misuse, use of inappropriate surrogate variables), and scenario uncertainty (descriptive errors, aggregation errors, errors in professional judgment, incomplete analysis)" (EPA 1997c). Variability is defined as "observed differences attributable to true heterogeneity or diversity in a population or exposure parameter" (EPA 1997c). Variability is the result of natural random process, such as variations in body weight, breathing rate or drinking water rates. Although variability cannot be reduced by further study, it may be better characterized by further measurements.

Some sources of uncertainty in the OU-2A HHRA process are described in the following sections.

8.1 UNCERTAINTY IN DATA REDUCTION AND CHEMICALS OF POTENTIAL CONCERN SELECTION PROCESS

For OU-2A, the selection of substances for inclusion in the risk assessment was quite conservative. The only chemicals not quantitatively evaluated in the risk assessment were those that are essential nutrients or were detected at a maximum concentration below the applicable EPA Region IX PRG (EPA 2002b). It is unlikely that chemicals eliminated from the risk assessment were either site-related or would have posed a health risk of significance. The uncertainty related with this component of the risk assessment is likely to result in an overestimation of risk by inclusion of chemicals that are not site-related. Also, no decrease in chemical concentrations over time was assumed to occur. This also results in a more conservative risk estimate.

Because all validated data were used, with the exceptions discussed in Section 4.1, the primary source of uncertainty during the COPC selection process relates to the criteria set forth in RAGS Part A (EPA 1989) and inherent in RAGS Part D (EPA 2001c) during the compilation of the RAGS Part D standard Table 2 series (COPC selection tables), as discussed in the following text.

8.1.1 Toxicity Screen

In past agency discussions, California regulators have voiced concern that screening against the PRG may eliminate COPCs so that total risk will be significantly underestimated. Consistent with Navy policy and guidance (2001, 2002), however, the PRG screen (conservatively set to the acceptable risk level of one in one million or a "safe" noncancer-based level equal to an HQ of 1) is considered conservative, particularly because of the following:

- Residential PRGs are used even though the more likely land use is commercial/industrial for most Alameda Point OU-2A sites (EPA 2002b).
- Uncertainty factors inherent in the underlying toxicity reference values upon which the PRGs are based range from 3 to 3,000, indicating a wide range of protection already inherent in the PRGs .

While an intermediate compromise, such as using a fraction of a PRG, has been debated, the use of some fraction of the residential PRG would result in screening levels that are lower than the method detection limit for many chemicals. PRGs lower than method detection limits would not be useful and could result in the inclusion of chemicals that do not add significantly to overall risks at the site, thereby unnecessarily wasting time and effort. In addition, risk assessments recently conducted for other, similar Naval facilities in the region (including Mare Island Naval Station and Naval Station Treasure Island) have used the full PRG as the screening criterion of choice, and no precedent has been established to justify the use of lower, modified PRGs at Alameda Point.

8.1.2 Elevated Detection Limits for Historical Poly-nuclear Aromatic Hydrocarbon Data

Because some historical PAH data for Alameda Point were observed to have elevated detection limits, by agency agreement, historic PAH data were excluded from the RI and HHRA. Instead, additional PAH sampling of the CERCLA sites was conducted in the summer of 2003. Because these PAH data will achieve detection limits that meet the DQOs for the RIs (that is, detection limits below Region IX PRGs), the HHRAs rely upon the low-detection limit PAH data, rather than historic data (EPA 2002b). The new PAH data meet all data usability requirements; however, historic data were not used in the PRG screen or the risk calculations because of the detection level problems. The use of more recent and valid PAH data is not likely to have a significant adverse impact on the calculation of risks for OU-2A. In fact, the more recent data are more likely to provide a more accurate representation of the actual risks at the site. Problems with elevated detection limits could result in (1) chemicals passing the toxicity screen based on detection limits that are above Region IX PRGs even if their actual concentrations are lower than

the PRG and (2) overestimation of risks because of the assumption that the concentrations of nondetects are assumed to be half of the detection limit.

8.2 UNCERTAINTY IN EXPOSURE ASSESSMENT

Uncertainties were identified in association with five areas of the exposure assessment process: (1) the selection of exposure scenarios, (2) the selection of exposure pathways, (3) the estimation of EPCs, (4) the use of exposure models, and (5) the selection of exposure variables used to estimate chemical intake. Uncertainties in each of these areas are discussed in Sections 8.2.1 through 8.2.5.

8.2.1 Exposure Scenarios

The exposure assessment relies on current and predicted future use of the land and the parameters that are available to estimate the magnitude and duration of exposures associated with those land uses. In many cases, the land uses are known; however, the range of exposure parameters available may lead to a wide range of risk estimates. In this risk assessment, reuse plans developed by the ARRA were used to select future potential receptors. In addition, the sites were evaluated for residential and construction worker scenarios even though these are not the planned reuses for these sites. In general, a residential exposure assessment is considered the most conservative assessment because it involves the longest and most extensive contact with environmental media at a site. Inclusion of domestic use of groundwater in the residential exposure increases the conservativeness of this assessment, especially because groundwater is not reasonably expected to serve as a public drinking water supply for the proposed land uses.

8.2.2 Selecting Exposure Pathways

The exposure pathways quantified in this risk assessment were identified on the basis of the area conceptual model, relevant site characterization data, and contaminant fate and transport considerations. To the extent that these factors may not accurately predict the migration of contaminants within and from the area, uncertainty is introduced into the exposure assessment. For example, although exposure pathways for potential future use were characterized based on a contact with all soils to depths of 2 and 8 feet below ground surface, these pathways may be complete only from a conceptual, or hypothetical, perspective. It is possible that a future worker or resident may never be exposed to soils at a depth of 2 feet or deeper, particularly if future redevelopment is shallow and soil contamination is not redistributed to the land surface. Therefore, risks may be overestimated, particularly for organics at OU-2A, given that the maximum concentrations of organic contaminants generally do not occur at the 0-to-6-inch (true surface) interval, where exposures are most likely.

8.2.3 Estimating Exposure Point Concentrations

The sample collection strategy was designed as a purposive investigation whereby samples were collected in areas of suspected or known contamination. The primary objective of this sampling

effort was to define the nature and extent of contamination. The EPCs based on these nonrandom soil samples are likely to overestimate the concentrations at the exposure point as well as the actual dose to the receptor.

8.2.4 Use of Exposure Models

At least two exposure model considerations were important to understanding the OU-2A HHRA findings, including the groundwater-to-indoor air model and soil-to-outdoor air models. Uncertainties are described briefly in the following text.

8.2.4.1 Uncertainty in Applying the Johnson and Ettinger Model

The federal EPA draft vapor intrusion guidance (2002c) outlined the applicability of the Johnson and Ettinger (1991) model, including important limitations to its application. While controversy still surrounds the use of this model, risk managers and the agencies agreed in 2001 that this model would be used to assess risk at Alameda Point (Tetra Tech 2001a). The present HHRA submittal assessed the applicability of the Johnson and Ettinger model (which underlies all three of the available tools for the assessment of indoor air risks, including the revised EPA model, the DTSC model, and the RWQCB model) and found it suitable, with the following caveats:

- The shallowest water table occurrence at OU-2A ranges seasonally to 5.2 feet bgs. The typical water depth at OU-2A is 8 feet bgs. This is therefore deeper than the minimum 5 feet cited in the draft EPA guidance as the shallowest depth for which the model should be applied (EPA 2002c).

- NAPL is present at three sites on OU-2A, as delineated on the groundwater sampling figures (Figures H.4-6 through H.4-10; see Section 7.2 as well as Sections 6.4, 8.4, and 9.4 of the RI report). These product plumes, however, are being actively remediated under the corrective action program. Samples containing NAPL were not included in the HHRA; thus, risks based on the maximum fringe concentrations were included. No NAPL or saturated soils are present elsewhere on OU-2A, so the applicability of the model elsewhere is confirmed.

Elsewhere on OU-2A, therefore, the Johnson and Ettinger (1991) model and its companion EPA draft guidance (EPA 2002c) as well as state-specific (DTSC and RWQCB) versions of the model are reasonable for Alameda Point OU-2A HHRA purposes, particularly since the locations without NAPL were modeled for vapor intrusion.

8.2.4.2 Uncertainty in Particulate Emission Factor and Volatilization Factor Approach

The default PEF recommended by EPA Region IX is based on bare, unvegetated soil and may therefore result in overestimation of COPC concentrations in outdoor air for sites where soil is or

will be covered by lawns or other vegetative ground cover. Vegetation generally significantly reduces the amount of dust and/or suspended particulate matter from the underlying soil.

8.2.5 Selecting Exposure Variables

The exposure variables used to estimate chemical intake are standard upperbound estimates. In reality, however, there may be considerable variation in the activity patterns and physiological response of individuals. It is possible that the exposure variables used in this evaluation do not represent actual future exposure conditions.

At the same time, the exposure parameters used in the HHRA for the Alameda OU-2A sites were standard default exposure parameters for workers and residents; the only receptor class requiring professional judgment was the construction worker. Because the defaults were generally used, this HHRA is expected to be comparable to others conducted within Region IX and California. All defaults are expected to err on the conservative side rather than underpredicting unforeseen human health risks.

Variability in exposure duration and frequency as well as breathing rates, soil ingestion rates, and amount of dermal contact with soil can be substantial. In this risk assessment, the RMEs were characterized for each receptor, which leads to a compounding of conservative assumptions that likely overestimates risk. The default RME parameters are selected to be representative of the 95th percentile of exposure or higher for each exposure pathway. For the residential RME, for example, a person is assumed to be exposed to COPCs at the site for 24 hours per day, 350 days per year for 30 years. Risks calculated for the CTE scenario (presented in Attachment H2 for comparative purposes) represent the average or median exposures for each scenario. These values, particularly for exposure frequency and duration, may be more representative of expected exposures. It is important to note that there are many different combinations of exposure parameters that will result in risk estimates between the RME and CTE risks presented here.

8.3 Uncertainty in Toxicity Assessment

The primary uncertainties associated with the toxicity assessment are related to derivation of toxicity values for COPCs. Standard RfDs and SFs developed by EPA were used to estimate potential cancer and noncancer health effects from exposure to COPCs at the site. These values are derived by applying conservative (health-protective) assumptions and are intended to protect the most sensitive potentially exposed individuals.

To derive the toxicity values, EPA makes several assumptions that tend to overestimate the actual hazard or risk to human health. Because data from human studies are generally unavailable, RfDs are typically derived from animal studies adjusted with uncertainty factors and modifying factors to ensure adequate protection of human health. For many compounds, this approach is anticipated to result in an overestimated potential for noncancer adverse health effects.

Derivation of SFs used to estimate cancer risk is also typically based on data from animal studies. These data are taken from studies in which high doses of a test chemical were administered to laboratory animals, and the reported response is extrapolated to the much lower doses to which humans are likely to be subjected. Very little experimental data are available on the nature of the dose-response relationship at low doses (for example, a threshold may exist or the dose-response curve may pass through the origin). Because of this uncertainty, EPA has selected a conservative model to estimate the low-dose relationship, and EPA uses an upperbound estimate (typically a 95 percent upper confidence limit of the slope predicted by the extrapolation model) as the SF. With this SF, an upperbound estimate of potential cancer risks is obtained.

A second uncertainty associated with toxicity values is the lack of RfDs or SFs for all COPCs at a site. The cancer risks and noncancer health hazards can be assessed only for those COPCs for which relevant toxicity values are available. For organic COPCs for which a SF or an RfD was available for only one route of exposure, route-to-route extrapolations were made. These extrapolations introduce some uncertainty into the risk and hazard estimates. Further, the use of oral toxicity values to assess the dermal pathway introduces additional uncertainty into the results; risks may be overestimated or underestimated using this approach. Risks may be underestimated for exposure to the PAH COPCs, which are based on toxicity equivalency factors of ten higher or lower than a baseline RfD for a surrogate PAH.

In addition to the uncertainties associated with derivation and availability of toxicity values, the toxicity assessment is affected by chemical-specific factors, as described in the following subsections.

8.3.1 Chromium Speciation

To evaluate the potential impacts to human health risk at OU-2A from the different forms of chromium, two soil samples were collected at Alameda Point and analyzed for both total chromium and hexavalent. One of the soil samples analyzed for total chromium and hexavalent chromium was collected at a depth of 1 foot bgs, while the other was collected from 9 feet bgs. Total chromium concentrations were 73.6 mg/kg and 76.9 mg/kg in the samples, while hexavalent chromium was not detected in either sample (method detection limits of 0.073 and 0.076 mg/kg), indicating that hexavalent chromium levels may be more than 1,000 times lower than total chromium at Alameda Point. Based on these analyses, the conservative assumption that soil chromium at OU-2A is total chromium is likely a conservative overestimate, given that EPA Region IX assumes a much higher (1:6) ratio of hexavalent chromium to trivalent chromium in developing its PRG for total chromium in soil (EPA 2002b). Further, when forward risk was calculated using trivalent chromium toxicity values, this was appropriately based on the absence of hexavalent chromium in OU-2A soils.

8.3.2 Surrogates for Total Petroleum Hydrocarbons

BTEX were independently quantified as surrogates for the assessment of potential risk and hazards associated with TPH. The assessment of TPH was thus dependent upon the adequacy of

the BTEX analytical data. Most samples were analyzed for BTEX, and the analytical results are expected to give an adequate representation of the health risks associated with potential exposure to TPH as gasoline. The magnitude of the uncertainties in the TPH assessment was assumed to be a function of the spatial distribution of TPH as diesel and motor oil contamination relative to the distribution of the samples analyzed for BTEX.

In general, however, it is generally accepted (DTSC 1993a) that assessment of the target compounds adequately describes human health risks at Superfund sites. This approach is not likely to significantly underestimate human health risks.

8.3.3 Arsenic Toxicity

Much of the uncertainty surrounding the arsenic PRGs relates to the underlying toxicity studies (EPA 2002b). The adverse health effects produced by arsenic are highly dose-dependent. For example, at low concentrations, arsenic may be an essential nutrient and substitute for phosphorus in key biochemical reactions (Agency for Toxic Substances and Disease Registry [ATSDR] 2000). At toxic levels, arsenic produces a severe form of peripheral arteriosclerosis known as blackfoot disease; the prominent pathological effect of chronic exposure to arsenic is plantar and palmar hyperpigmentation and hyperkeratotic lesions (ATSDR 2000).

The largest controversy surrounding arsenic is whether the cancer-based PRG is realistic, given the extrapolations inherent in the PRG process as well as the uncertainty of applying an SF that was derived for other media (air and water) versus soil. The uncertainties associated with the ingestion of inorganic arsenic are such that estimated cancer-based PRGs for arsenic are overly conservative and could be modified upwards as much as an order of magnitude relative to risk estimates associated with most other carcinogens. EPA has recognized this in the past and allowed management and screening of arsenic cancer risks at the 1×10^{-5} risk level or above so long as noncancer effects of chronic arsenic exposure are also considered.

In addition, studies have shown that arsenic in soil is likely to be absorbed to a lesser degree than arsenic in solution (ATSDR 2000). Because the oral SF for arsenic was based on ingestion of arsenic in solution, its use is likely to overestimate the carcinogenicity of soil-bound arsenic. In fact, bioavailability of arsenic has reportedly ranged from 20 percent in monkeys (Freeman and others 1994) to 78 percent in swine (Lorenzana 1995); in fact, a relative bioavailability factor of 78 percent was adopted by Texas in its development of PRG-like, state risk-based protective concentration levels. If bioavailability were taken into account, arsenic cancer-based PRGs could be increased by as much as 80 percent. While arsenic is a class A, known human carcinogen based on sufficient evidence of observed increased lung and skin cancer in human populations (EPA 2003a), uncertainty surrounds the use of the derived SFs in assessing risks from soil.

8.3.4 Surrogates for Preliminary Remediation Goals Screening

While the selection and use of surrogates for PRG screening is not ideal, the surrogates selected for use in the COPC screening process were all very closely structurally related to the contaminants they were chosen to represent (EPA 2002b). A lack of a PRG would otherwise remain a data gap. The degree of uncertainty contributed by the use of surrogates in this manner is unknown but is not expected to result in underestimates of risk.

8.3.5 Use of Federal Toxicity Criteria Instead of California Values

As introduced in Section 6.6, to provide for a conservative estimate of potential risk, DTSC advocates use of state of California toxicity values. For consistency with Navy risk assessment guidance (Navy 2002) and EPA (2002b) guidance, consideration of DTSC Office of Environmental Health Hazard Assessment (OEHHA) toxicity values is necessary in only limited chemical-specific cases, such as where a Cal-modified PRG has been developed. This focuses a HHRA on those contaminants where the underlying toxicity factor was determined by EPA Region IX to be significantly more protective than the federal EPA-recommended toxicity value. EPA Region IX has concurred with DTSC and developed a Cal-modified PRG for (other than for lead) only seven chemicals (chloroform; 1,2-dibromo-3-chloropropane; 1,1-DCA; methyl tertiary-butyl ether [MTBE]; benzo[k]fluoranthene [BKF]; chrysene; and 2,4,6-trichlorophenol), as of the latest EPA Region IX PRG table (EPA 2002b). A small subset of these were detected or selected as COPCs for specific sites, as detailed in Section 8.3.5.1.

In addition, a technical review of the remaining COPCs at OU-2A for which a Cal-modified PRG does not exist but for which the OEHHA cancer potency values is 4 times more conservative than the federal EPA value was conducted in Section 8.3.5.2. The Navy (2002) has noted that "it is unclear the extent of peer review conducted for the California toxicity values." In contrast, the federal EPA values are generally more rigorously reviewed. The conclusions relative to the OU-2A risk characterization are presented in Section 8.3.5.3.

8.3.5.1 Chemicals of Potential Concern with Cal-Modified Preliminary Remediation Goals: No Impact on Risk Characterization

The following OU-2A COPCs are chemicals with a Cal-modified PRG (indicating that DTSC and EPA Region IX have agreed that their toxicity evaluations are significantly different):

- Site 9 groundwater included the COPCs 1,1-DCA, MTBE, BKF, and chrysene (Table H-3.5)
- Site 13 soil included the COPCs BKF (in surface; Table H-3.7) and BKF and chrysene (all depths; Table H-3.9)
- Site 19 groundwater included the COPC 1,1-DCA (Table H-3.17)

- Site 22 groundwater included the COPC chloroform (Table H-3.23)
- Site 23 soil included the COPC BKF (Tables H-3.25 and H-3.27) and groundwater included the COPC chrysene (Table H-3.29)

The impact to risk conclusions for each OU-2A site is presented (by site) in the following text.

Site 9

Although 1,1-DCA, MTBE, BKF, and chrysene were COPCs in groundwater at Site 9 (Table H-3.5), ultimately the only risk driver (for hypothetical residential whole house use exposures) was BKF. BKF is used as an example for Site 9 groundwater to show that the use of a DTSC-recommended OEHHA toxicity value does not change the risk conclusion for Site 9 groundwater. For BKF, the total chemical risk of 2×10^{-6} (which is the rounded sum of the 1.18×10^{-6} adult risk from Table H-9.1.3 and 7.8×10^{-7} child risk from Table H-9.1.4) falls within the risk management range. Changing to use the OEHHA SF of 1.2 per mg/kg-day versus EPA's 0.073 per mg/kg-day results in the total BKF chemical risk of approximately 3.3×10^{-5}. Groundwater ingestion risks for hypothetical whole house use (including ingestion) were already 1.9×10^{-3} (and posed an unacceptable risk according to the 1×10^{-4} CERCLA bright line), so increasing the risk because of BKF does not change the risk characterization for Site 9 groundwater. Similar increases would be seen for the other three COPCs, and it would still be concluded that risks are above the 1×10^{-4} bright line for hypothetical residential use.

Site 13

Although BKF and chrysene were COPCs in soil at Site 13 (Table H-3.9), neither were risk drivers (for hypothetical residential redevelopment including exposures to 8 feet bgs). The use of a DTSC-recommended OEHHA toxicity value for BKF and chrysene does not change the risk conclusion for Site 13 soil. For BKF, the total chemical risk of 1.5×10^{-8} (which is the rounded sum of the 5×10^{-9} adult risk from Table H-9.2.6 and 1×10^{-8} child risk from Table H-9.2.7) falls well below the risk management range. Changing to use the OEHHA SF of 1.2 per mg/kg-day versus EPA's 0.073 per mg/kg-day results in the total BKF chemical risk of approximately 2.5×10^{-7}, which is still well below the risk management range; BKF would still not be a risk driver. For chrysene, the total chemical risk of 4.5×10^{-9} (which is the rounded sum of the 1.5×10^{-9} adult risk from Table H-9.2.6 and 3×10^{-9} child risk from Table H-9.2.7) falls well below the risk management range. Changing to use the OEHHA SF of 0.12 per mg/kg-day versus EPA's 0.0073 per mg/kg-day results in the total chrysene chemical risk of approximately 7.4×10^{-8}, which is still well below the risk management range; chrysene would still not be a risk driver. Soil risks for hypothetical future receptors were already in the risk management range at 2×10^{-5}, so increasing the risk because of BKF and chrysene would not change the risk characterization for Site 13 soil. Risks would still fall in the risk management range for hypothetical residential site reuse.

Site 19

The State of California considers 1,1-DCA to have carcinogenic potential, whereas EPA does not have a cancer potency value for 1,1-DCA (Cal/EPA 2002). Although 1,1-DCA was a COPC in groundwater at Site 19 (Table H-3.17), it ultimately presented only negligible ingestion and inhalation noncancer hazards (0.017 and 0.002, respectively, as shown in Table H-9.3.7). If 1,1-DCA were assessed as a California carcinogen for Site 19, the risk characterization would not change. Specifically, groundwater ingestion risks for hypothetical whole house use (including ingestion) were already 2.4×10^{-4} (and posed an unacceptable risk according to the 1×10^{-4} CERCLA bright line), so increasing the risk because of the addition of 1,1-DCA ingestion cancer risk does not change the risk characterization for Site 19 groundwater. For inhalation risk, designation of 1,1-DCA as a carcinogen and use of the OEHHA SF of 5.7×10^{-3} per mg/kg-day results in an additional total residential inhalation chemical risk of 3.2×10^{-7}, which when added to the EPA cancer risk of 3×10^{-6} to sum to 3.3×10^{-6} still falls within the risk management range. Thus, no change to the risk characterization for Site 19 groundwater would result if California's SF were used.

Site 22

The State of California considers chloroform to have both ingestion and inhalation carcinogenic potential (Cal/EPA 2002); EPA does not have an oral cancer potency value for chloroform, but provides an inhalation unit risk factor in IRIS (EPA 2003a) that was developed in 1987. Although chloroform was a COPC in groundwater at Site 22 (Table H-3.23), it ultimately presented only negligible ingestion and inhalation noncancer hazards (0.08 and 0.19, respectively, as shown in Table H-9.4.4). If chloroform were assessed with the California SF as a carcinogen for Site 22, the risk characterization would not change. Specifically, groundwater ingestion risks for hypothetical whole house use (including ingestion) were already 2.6×10^{-3} (and posed an unacceptable risk according to the 1×10^{-4} CERCLA bright line), so increasing the risk because of the addition of chloroform ingestion cancer risk does not change the risk characterization for Site 22 groundwater. For inhalation risk only, use of the OEHHA inhalation SF of 1.9×10^{-2} per mg/kg-day versus the EPA SF of 8.05×10^{-2} actually results in reduction to the residential inhalation chemical risk by a factor of four. Even with this reduction in chloroform inhalation risks, passive vapor inhalation risks still fall within the risk management range. Thus, no change to the risk characterization for Site 22 groundwater would result if California's SF were used.

Site 23

Although BKF was a COPC in soil at Site 23 (Tables H-3.27 and H-3.29 for surface and subsurface soil), it was not a risk driver for any scenario. For BKF, the total chemical risk of 1.7×10^{-8} (which is the rounded sum of the 5.4×10^{-9} adult risk from Table H-9.5.3 and 1.1×10^{-8} child risk from Table H-9.5.4) falls well below the risk management range. Changing to use the OEHHA SF of 1.2 per mg/kg-day versus EPA's 0.073 per mg/kg-day results in the total BKF chemical risk of approximately 2.8×10^{-7}, which is still well below the risk management range; BKF would still not be a risk driver. For residential and commercial/industrial worker receptors, cancer risks for soil pathways at Site 23 still fall within

the risk management range. Thus, no change in the overall risk characterization for Site 23 soils would result if California's SF were used.

For chrysene in Site 23 groundwater, the total chemical risk of 3.6×10^{-7} (which is the rounded sum of the 2.1×10^{-7} adult risk from Table H-9.5.6 and 1.5×10^{-7} child risk from Table H-9.5.7) falls well below the risk management range. Changing to use the OEHHA SF of 0.12 per mg/kg-day versus EPA's 0.0073 per mg/kg-day results in the total chrysene chemical risk of approximately 5.9×10^{-6}, which falls within the risk management range. Specifically, groundwater ingestion risks for hypothetical whole house use (including ingestion) were already 3.3×10^{-4} (and posed an unacceptable risk according to the 1×10^{-4} CERCLA bright line), so increasing the risk because of the additional chrysene cancer risk does not change the residential risk characterization for Site 23 groundwater.

8.3.5.2 Other Chemicals of Potential Concern with Significant Difference Not Recommended

The following section contains chemical-specific examples for benzene and vinyl chloride of (a) the difference between the federal EPA toxicity value and the OEHHA value, (b) the implication of use (magnitude of the difference), and (c) recommendation setting forth the best, scientifically valid, peer-reviewed, and appropriate toxicity value for use. EPA's IRIS information was reviewed August 5, 2003 (EPA 2003a).

Benzene

The federal EPA did an extremely in-depth, comprehensive updated toxicological review of benzene by experts in the subject (with extensive peer reviews) completed in 1998 based on literature through 1997. The California OEHHA values are based on data from a Proposition 65-based weighted cumulative exposure/relative risk procedure from 1988 (OEHHA 2002) that predated that EPA review by 10 years. Further, the California OEHHA values incorporated animal data to develop the human cancer potency value, while the federal EPA values used human inhalation data related to leukemia incidences that were available and suitable. EPA Region IX has not developed a Cal-modified PRG (EPA 2002b) based on the OEHHA values, possibly because of the weakness underlying the OEHHA value and more recent federal assessment, despite the fact that it is over 4 times more conservative. The federal EPA values were subject to rigorous peer review process that is well documented and publicly available. The details of the peer review, however, are not publicly available. For these reasons, the federal EPA value (not the California OEHHA value) was used in the Alameda OU-2A HHRA.

Vinyl Chloride

The federal EPA did an extremely in-depth, comprehensive updated toxicological review of vinyl chloride (with two external peer reviews) completed in 2000. The California OEHHA values predated that EPA review and used a more basic model and simple scaling to develop the cancer potency value. The model used by EPA (a physiologically based pharmacokinetic [PBPK] model) is much more sophisticated than the default conversion used by California OEHHA. Also, EPA Region IX has not developed a California PRG based on the OEHHA

values (EPA 2002b), possibly because of the weakness underlying the OEHHA value, despite the fact that it is nearly 9 times more conservative. The federal EPA values were peer reviewed by an internal EPA expert panel and subjected to two external scientific peer reviews. The results of the external peer review are publicly available on IRIS(EPA 2003a), while no peer review details are publicly available for the OEHHA values. For these reasons, the federal EPA value (not the California OEHHA value) was used in the Alameda OU-2A HHRA.

8.3.5.3 Conclusions on Use of State versus Federal Toxicity Values

Section 8.3.5.1 found no change to the risk characterization for any site based on use of California toxicity values where EPA Region IX has developed a Cal-modified PRG to acknowledge the significant difference between federal and state toxicity values (EPA 2002b).

For those chemicals exemplified in Section 8.3.5.2 where a potentially significant mathematical difference exists, the federal toxicity values have been found to be more current and scientifically robust, as documented therein.

For these reasons, the Alameda Point OU-2A HHRA would not benefit from a separate assessment of the state toxicity values, as the conclusions of the risk characterization would not change. In particular, since much of OU-2A is proceeding to the FS stage (see Section 10 of the RI report), impacts to risk management conclusions would be insignificant if a separate assessment were conducted solely with California-recommended toxicity values.

8.3.6 Route-to-Route Extrapolation

Route-to-route extrapolation was employed for some OU-2A COPCs that currently lack toxicity factors. Inhalation toxicity factors for several VOCs were route extrapolated from oral toxicity factors; this approach presupposes that inhalation of these chemicals is as hazardous as ingestion and that the effects would be exerted in the same manner. Also, in this assessment, toxicity values were used to assess risks from dermal exposure without adjustment for gastrointestinal absorption efficiency. The approach used at OU-2A (i.e., use of oral toxicity reference values for dermal assessment) is an uncertain extrapolation, but follows Navy guidance on the topic (Pioneer Technologies Corporation 2001). Use of oral toxicity reference values avoids introducing elevated risks that result from the adjustment of oral toxicity reference values based on gastrointestinal absorption efficiency, which has been noted to increase risks proportionally with the gastrointestinal absorption factor.

8.3.7 Chemicals Lacking Toxicity Criteria

Toxicity values have not been developed for all chemicals; however, in these cases, risk or hazard indices may be underestimated. Toxicity values may not be available for a variety of reasons. A chemical may not have been studied. Studies conducted may have been inconclusive. The chemical may have been studied only as part of a mixture; no chemical-specific information was generated. In each case, the lack of a toxicity value is likely to cause an underestimate of risk. The magnitude of the underestimation is unknown because a lack of a toxicity value indicates the lack of any reliable toxicity information.

8.3.8 Manganese Toxicity Criteria

The Region IX manganese RfD of 0.024 mg/kg-day includes nonstandard methodology that is inconsistent with the IRIS (EPA 2003a) file, inconsistent with the treatment of other essential nutrients in Superfund risk assessment, and inconsistent with other EPA regional approaches. Manganese is flagged on the October 1, 2002, Region IX PRG table (EPA 2002b), "Non-Standard Method Applied" (See Section 2.3 of the "Region IX PRGs Table User's Guide"), which reads as follows:

> The IRIS RfD (0.14 mg/kg-day) includes manganese from all sources, including diet. The author of the IRIS assessment for manganese recommends that the dietary contribution from the normal U.S. diet (an upper limit of 5 mg/day) be subtracted when evaluating non-food (e.g. drinking water or soil) exposures to manganese, leading to a RfD of 0.071 mg/kg-day for non-food items. The explanatory text in IRIS further recommends using a modifying factor of 3 when calculating risks associated with non-food sources due to a number of uncertainties that are discussed in the IRIS file for manganese, leading to a RfD of 0.024 mg/kg-day. This modified RfD is applied in the derivation of the Region IX PRGs for soil and water.

Although the IRIS file does not dictate that the dietary contribution be subtracted from the total "safe" dose before the conversion of the modifying factor of 3, Region IX interpreted the order of operations as such. In the case of manganese, Region IX has chosen to convert the RfD in a chemical-specific way that is not employed for any other essential nutrient. All essential elements have a dietary component by definition, but no other elements' reference doses are lowered by subtracting the dietary contribution before the application of modifying factors. This approach to the manganese RfD was first disclosed in detail in the latest (October 1, 2002) "Region IX PRGs Table User's Guide." Other EPA regions (including Region VI, current as of November 26, 2002) have interpreted the IRIS file differently and applied the modifying factor of 3 to the full oral RfD of 0.14 mg/kg-day without first subtracting dietary exposure. This would decrease the noncancer hazards reported for manganese throughout the OU-2A HHRA.

8.3.9 Trichloroethene Toxicity

The estimation of human health effects associated with exposures to TCE is clouded by controversy regarding the appropriateness of existing toxicity criteria for all receptors. The toxicity of TCE has been under review and evaluation by EPA with respect to potential cancer and noncancer effect levels, but no values have been finalized as of 2003, and EPA's IRIS database (EPA 2003a) does not currently recommend any specific values for quantification of risks associated with TCE exposure. This lack of toxicity guidance is problematic for risk assessors since TCE is associated with several adverse health effects, including neurotoxicity, immunotoxicity, developmental toxicity, liver toxicity, kidney toxicity, endocrine effects, and several forms of cancer (NCEA 2001). Metabolic studies indicate that exposure to TCE results in internal exposure to a complex mixture of TCE 's metabolites (such as trichloroacetic acid [TCA] and dichloroacetic acid [DCA]), which may be responsible for much of the toxicity associated with TCE. In some assays, TCE has been shown to be inactive in the absence of its metabolites (NCEA 2001). Evidence suggests that some subpopulations may be more sensitive

to the toxic effects of TCE than others and that TCE could affect children and adults differently. TCE exposure can result in increases to the toxicity of other chemicals, but methods to quantify this relationship have not been established by the regulatory community; as a result, qualitative consideration of the cumulative effect of TCE in the presence of other environmental contaminants is important.

NCEA has endorsed use of provisional values for health effects associated with TCE exposure that were derived using PBPK methods and route extrapolation (NCEA 2001). For effects other than cancer, NCEA recommends an oral RfD of 3×10^{-4} mg/kg-day based on critical effects to the liver, kidney, and developing fetus, and an inhalation RfC of 4×10^{-2} mg/m^3, based on critical effects to the central nervous system, liver, and endocrine system observed in subchronic studies in mice and rats at doses as low as 1 mg/kg-day. The primary source of uncertainty associated with the TCE toxicity factors is the use of subchronic exposure data to represent chronic exposure.

NCEA has recommended several SFs for TCE, with most between 2×10^{-2} and 4×10^{-1} per mg/kg-day. The range of SFs has not been reduced to a single number, but NCEA recommends that risk assessors use the upper end of the SF range to emphasize the possibility that different risks may exist under different circumstances. The use of the upper end of the range of SFs is conservative and should not result in underestimation of risks associated with exposures to TCE.

8.3.10 Ethylbenzene Carcinogenicity Classification and Provisional Slope Factor

The EPA IRIS database (EPA 2003a) currently lists ethylbenzene in the weight of evidence class D group, indicating a lack of animal and human data as the basis for a conclusion that ethylbenzene has carcinogenic potential. While the EPA Region IX PRG tables list an inhalation SF (and route-extrapolated oral SF) derived by the EPA's NCEA, the IRIS carcinogen classification was to have been given precedence following the toxicity hierarchy to be used in PRG development (EPA 2002b). Carcinogenic risks for ethylbenzene were quantified for this risk assessment based on the EPA Region IX recommendation that ethylbenzene be considered a carcinogen; however, significant controversy exists regarding ethylbenzene's potential to cause cancer following inhalation exposure. Much of this controversy is based on findings by the National Toxicology Program (NTP) (1999), which studied ethylbenzene because of its potential for widespread human exposure and the structural similarity to benzene and toluene. The NTP study involved the inhalation exposure of male and female F344/N rats and B6C3F1 mice to ethylbenzene for 2 years at a frequency of 6 hours per day, 5 days per week. These studies reportedly showed "clear" evidence of carcinogenic activity of ethylbenzene based on increased incidences of renal tubule neoplasms and testicular adenoma in male F344/N rats and "some" evidence of carcinogenic activity as increased incidences of renal tubule adenomas in female F344/N rats. "Some" evidence of carcinogenic activity was also observed in mice as increased incidence of alveolar/bronchiolar neoplasms in male B6C3F1 mice and increased incidence of hepatocellular neoplasms in female B6C3F1 mice. During previous toxicity studies in which F344/N rats and B6C3F1 mice were exposed to ethylbenzene by inhalation for 13 weeks, no histopathologic changes were observed (NTP 1992). The purity of the test chemical and the well-known fact that ethylbenzene may contain trace BTEX compounds as a result of an imperfect refining process (resulting in an inability to attribute measured effects to pure ethylbenzene) must be addressed during interpretation of the NTP (1999) findings. EPA will be

considering the entire body of scientific literature to determine whether the ethylbenzene carcinogenicity classification should be developed.

8.3.11 Use of *cis*-1,2-Dichloroethene as Surrogate for Toxicity of Total 1,2-Dichloroethene Mixture

During some sampling events at Alameda Point, some (particularly historical) analyses did not differentiate the cis- and trans- isomers of 1,2-DCE, instead reporting 1,2-DCE concentrations as "total 1,2-dichloroethene." As the toxicities of the cis- and trans- isomers of 1,2-DCE differ, it was conservatively assumed that all total 1,2-DCE was the more toxic cis-1,2-DCE isomer, and all toxicity factors for 1,2-DCE, including PRGs, RfDs, and RfCs for the cis-DCE isomer were assumed to represent the toxicity of the total 1,2-DCE mixture. This assumption is conservative and would result in overestimation of risk since the inhalation RfD (based on route-to-route extrapolation for both chemicals) for cis-1,2-DCE (0.01 mg/kg-day from HEAST [EPA 1997a]) is 50 percent lower (more protective) than that of the trans-isomer (0.02 mg/kg-day [EPA 2003a]).

8.4 UNCERTAINTIES IN RISK CHARACTERIZATION

Standard EPA methodologies were used for the risk characterization step. Uncertainty arises however in the assumption of additivity, presentation of point estimates rather than risk ranges, and may be sensitive to COPC selection when considering total risk.

8.4.1 Additivity Assumption in Risk Characterization

Using these methods, the risks from exposure to multiple carcinogens were added to estimate the total cancer risk associated with exposures at a site. According to EPA guidance (EPA 1989), "uncertainties associated with summing risks or hazard indices for several substances are of particular concern in the risk characterization step. The assumption of dose additivity ignores possible synergisms or antagonisms among chemicals, and assumes similarity in mechanisms of action and metabolism. Unfortunately, data to assess interactions quantitatively are lacking." EPA guidance recommends summing the risks and hazard indices to avoid underestimating cancer risk or potential noncarcinogenic health effects at a site, despite the concerns stated previously. Summing the risks and HIs may overestimate results because similarity in mechanisms of action and metabolism are assumed to be similar and because potential antagonistic effects are ignored. It is also possible that total risks and HIs may be underestimated because potential synergistic effects are ignored.

8.4.2 Presentation of Point Estimates in Risk Characterization

Overall, RME risks and HIs presented in this HHRA for each site are conservative estimates and are more likely to be overestimated than underestimated. The estimates presented here are single-point estimates rather than a range of values. Rarely do single-point estimates accurately represent actual exposures, however, and much information on variability is lost by using single-point estimates of exposure rather than distributions. As stated in DTSC guidance, "Uncertainty and variability in the movement of the chemical across the environment as well as

the nature of the potential human exposures mean that the risk is more accurately characterized by a range or distribution" (DTSC 1995). When decisions are made based on risk estimates, the range of risks should be considered. Several of the toxicity values (such as those for benzene and TCE) are also ranges of values (not point estimates), such that the resulting risk predicted can also be a range of values, sometimes spanning an order of magnitude. This information is lost upon presentation of the highest (most conservative) risk using the most conservative end of the toxicity range.

8.4.3 Total Risk versus Incremental Risk

DTSC has voiced an interest in ensuring that not only incremental risk contributed by Superfund releases and former site operations at Alameda Point are characterized but that total risk (with no risk-based screen, such that all detected analytes were included in the risk assessment) is communicated as well. To effectively communicate these differences and continue to follow Navy (2001) guidance that implements a risk-based screening step, the following total risk screening was conducted as part of the site-specific risk characterization step in Section 7.5. Based on current reuse plans, most exposures at OU-2A are likely to be associated with soil; as a result, and for demonstrative purposes, the analysis focused on soil.

In this process, all detected contaminants in soils were evaluated, and the maximum detected concentration was screened relative to its residential PRG (EPA 2002b). Effectively, this screening is a shortcut (suggested in the Navy tiered guidance; Navy 2001) that still presents enough information to ensure that human health risks are not being underpredicted by use of a COPC screen on PRGs. Findings of this approach are presented on a site-specific basis in Section 7.5. It is concluded that the COPC screen was protective and appropriately followed Navy (2001) guidance.

A total risk evaluation (with no risk-based screen, such that all detected analytes were included in the risk assessment) should have no impact on the risk management decisions based on the conclusions of Section 7.5.

8.5 Chemicals of Potential Concern Present Below Ambient Concentrations

The site-specific contribution to total risk based on inorganic compounds below base-wide ambient groundwater or "blue" area background soil data is presented in Section 7.5, as it is site-specific. In general, however, arsenic was frequently a major contributor to total risk. This should be taken into account for risk management decisions.

8.6 Uncertainty Summary

This HHRA was developed based upon a series of assumptions, almost all conservative, that are expected to yield an overestimation of risks. Even considering a few uncertainties contributing to a small underestimate of risk, the compounding conservatism in the HHRA process is expected to negate the assumptions that may lead to underestimating risks.

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